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PRESIDENT THOMAS D. ROWE: A BIOGRAPHICAL SKETCH *

MELVIN R. GIBSON

Thomas D. Rowe was born June 25, 1910, in Missoula, Montana, the son of Jesse P. and Anna Richards Rowe. As Dr. Lyman expresses it "Tom's ancestors were good stock, and I believe it's a great heritage for a man to have good stock." Dr. Jesse Rowe was professor of geology and chairman of the department at the University of Montana. As an undergraduate at the University of Nebraska, the elder Rowe was Dr. Lyman's classmate; and, as Dr. Lyman describes him, "even as an undergraduate he had a dignified, scholarly, and professional mien." A prolific researcher and writer in his field of geology, he received his doctorate from the University of Nebraska and in 1935 was awarded an honorary Doctor of Science by his alma mater.

And thus appropriately launched in an academic aura, Tom Rowe pursued his early education in Missoula, attended the University of Michigan from 1927-29 and the University of Montana from 1929-33, receiving his bachelor of science in pharmacy and master of science degrees from the latter institution. As an undergraduate he earned freshman numerals in football at Montana and was intercollegiate tennis champion of Montana for two years, earning three letters in tennis. The genesis of his interest in the more sedentary sport of poker was not defined to the author as beginning this early; neither was his success (past or present) in this activity clarified.

Along with his studies, he worked in a retail pharmacy for three years. In 1934 he married Georgia Stripp. As described by Dr. Lyman, "Fortunately before he came to Nebraska he married one of the nicest, most intelligent women I have ever known . . . and she has all the fine qualities that a wife needs to have to hold a rambunctious husband in his place. . . . I have a special fondness for her. . . . Any biography of Tom Rowe would be incomplete without some credit being given to Georgia." And thus complemented by a wife possessed of genuine charm and friendliness, Tom Rowe began his career in teaching.

Dr. Lyman describes it this way: "Jesse Rowe . . . wrote me in the spring of 1934 that his son, Tom . . . had decided he wanted to go into pharmaceutical teaching, and did I know of an opening. I took Tom for that year to replace Dr. Burt who was on leave . . . and although he had no teaching experience, he did an excellent job that year."

* The author is indebted to the following persons for supplying requested information concerning President Rowe: Dr. Rufus A. Lyman, Dean Emeritus of the College of Pharmacy of the University of Nebraska and of the College of Pharmacy of the University of Arizona, Consulting Editor of this journal; Dr. Harlan Hatcher, President of the University of Michigan; Dr. R. Blackwell Smith, Jr., President of the Medical College of Virginia; Mr. John H. Butts, Executive Secretary of the Michigan State Pharmaceutical Association.

In August of 1935 at the AACP-A.Ph.A. conventions in Portland, Oregon, Tom Rowe favorably impressed Dean Wortley Rudd of the Medical College of Virginia. In 1935 he began a ten-year period of teaching at that institution during which he rose from instructor to associate professor and assistant dean. During the summer periods of 1936-40, he worked on his Ph.D. degree at the University of Wisconsin, and with a leave of absence from MCV during 1940-41, he completed the degree, studying under Dr. Edward Kremers and Dr. Lloyd Parks.

In 1942 he became the proud father of Tom, Jr., who is described today by friends as "an exceptionally brilliant young man."

At the Medical College of Virginia Tom Rowe was described by Dean Rudd as "the best prospect of becoming a superior administrator I have ever had on my staff." As a student, Dr. Smith remembers Tom Rowe for "the thoroughness of his lectures and his insistence that his students apply themselves with vigor to his courses. . . . Although he was a hard taskmaster, he was fair in his relationships with students; and I believe he was genuinely appreciated as a good teacher and friendly human being. . . . He is a capable, energetic, and dedicated person; and I am grateful for the relationships I had with him as a student and friend."

With this solid background of experience, Tom Rowe in 1945 became heir apparent to the deanship at Rutgers University by being appointed professor of pharmacy and assistant dean at that institution. As one of his friends expresses it, "He had his early training as a pharmaceutical educator and politician under those two masters of the art, Rufus A. Lyman and Wortley Rudd. As a protégé of these men, he learned many of the fine arts of climbing over transoms and peering into closets."

In 1946 Rowe became dean at Rutgers, a post he held until 1951. During this period he became active in the national activities of pharmacy and pharmaceutical education. His first national office prior to this time was the presidency of Friends of Historical Pharmacy (1942-44). He served as chairman of the AACP Committee on Activities for Alumni (1943-46); national vice president of Rho Chi Society (1945-47); national president, Rho Chi Society (1947-48); chairman, AACP Committee on Limitation of Enrollment (1946-48); vice president, AACP (1949-50); and chairman, A.Ph.A. Committee on Public Relations and Pharmacy Week (1948-51). In the New Jersey area he served as president of the Northern New Jersey Branch of the A.Ph.A. (1947-48) and secretary-treasurer of the District Two AACP-NABP.

In 1951 he was chosen dean of the College of Pharmacy of the University of Michigan. Mr. Butts comments on his arrival in Michigan as follows: "The two items I noted about Dean Rowe when he came to Michigan were: (1) Promptness of answering correspondence and notices. He seemed to have letters back before the postman had time to deliver them. He never seems to put anything off until tomorrow. (2) His willingness and capacity for work. He had not been in this state long enough to settle his furniture before he seemed to be on every committee and chairman of important ones, such as legislation. He travels often and covers many meetings from one end of our large state to the other." The first observations were not all that impressed retail pharmacy in Michigan. Mr. Butts continues, "He has made, here in Michigan, significant contributions to better understanding among the pharmacy groups. His unassailable standards make him constantly a reference point for speeches and articles. He is a recognized authority, scrupulously fair, and conscientiously humane. . . .

FIG. 1 THOMAS D. ROWE

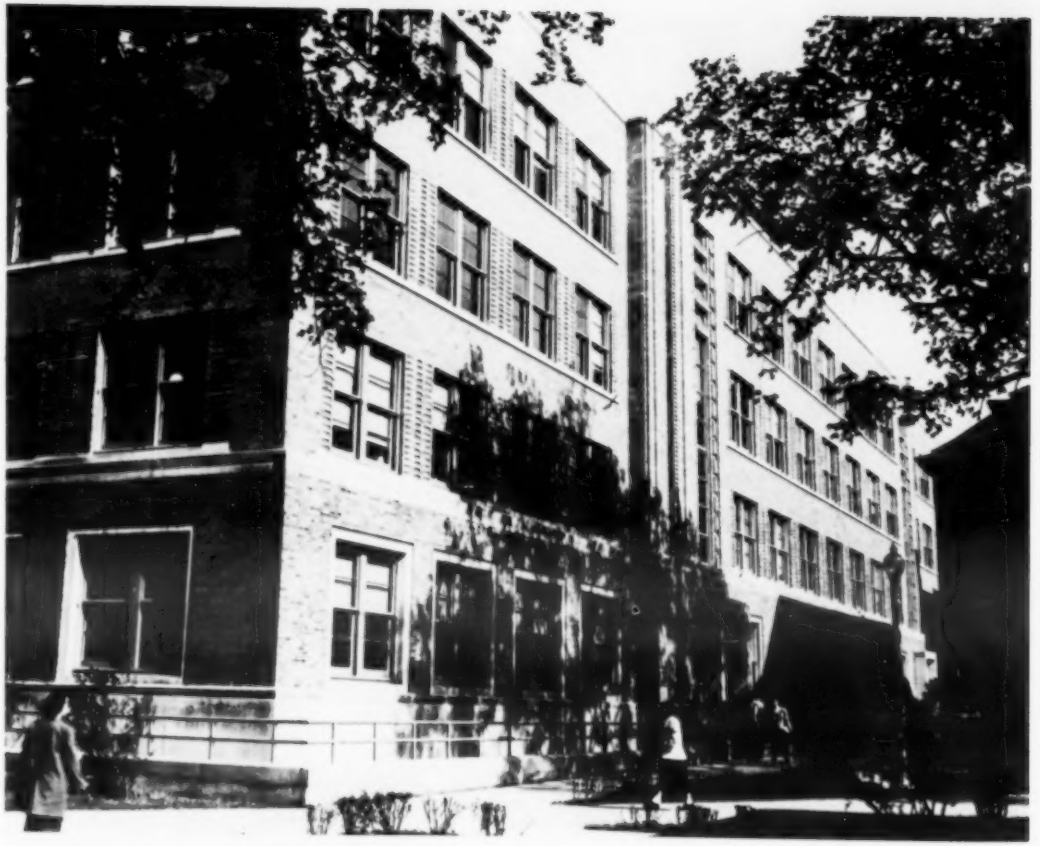

FIG. 2 CHEMISTRY-PHARMACY BUILDING, UNIVERSITY OF MICHIGAN

We would fight at the drop of the hat any effort to steal his services from our good state."

Tom Rowe's impression on the senior administrator at the University of Michigan, President Hatcher, has been summarized by Dr. Hatcher: "Dean Rowe is one of our best. He works hard, makes friends for the University and for himself."

At the state level in Michigan he has served as the chairman of the Legislative Committee of the Michigan State Pharmaceutical Association (1953-56). In 1956 he was given the "Award of Distinguished Service" by the Michigan State Pharmaceutical Association.

Since going to Michigan, he has served as chairman of the AACP Committee on Relations of Boards and Colleges of Pharmacy (1952-54); first vice president of the A.Ph.A. (1952-53); chairman, Committee of Teachers' Seminar on Pharmaceutical Chemistry (1952); chairman, A.Ph.A. Committee on Local Branches (1953 to present); and representative from the AACP to the American Council on Pharmaceutical Education (1954 to present). Currently he is also chairman of the AACP Committee on Hospital Pharmacy Education.

With all this activity at the state and national level, Dean Rowe continues to render service to his community. Currently he is president of the Ann Arbor Amateur Hockey League, which is made up of about three hundred boys between the ages of nine and eighteen. He is vice president and a member of the board of the Ann Arbor Golf and Outing Club, vice president and a member of the Board of the Michigan Academy of Pharmacy, and chairman of the Program Committee of the Ann Arbor Rotary Club. At the University of Michigan, he functions on the Student Health Service Advisory Committee, Library Advisory Committee, and Relations with Junior Colleges Committee. And he even finds time to play golf!

Dean Rowe is a member of Rho Chi, Phi Kappa Phi, and Sigma Xi; an honorary member of Phi Beta Kappa; a member of Kappa Psi and Sigma Chi; a member of the Ann Arbor Rotary, the Michigan State Pharmaceutical Association, the Michigan Academy of Pharmacy, and the A.Ph.A. He is listed in *Who's Who in America, Who's Who in the Middle West, Who's Who in Teaching,* and *American Men of Science.*

Obviously the Association can point with pride to a President who is an administrator and leader of the highest caliber who has served pharmacy and pharmaceutical education in its highest tradition. In the words of Dr. Lyman, "I am certain that pharmaceutical education will be advanced because he was President of the American Association of Colleges of Pharmacy."

A spiritual people are an idealistic people, although they may be realistic too. No one would suggest, certainly, that we should not be realistic. But not enough people are sticking up for what inherently is their own belief—that we could do with far more sincere idealism. . .

R. A. Kuever, Am. J. Pharm. Ed., 6, 438 (1942)

FEATURE SECTION

Editor's Note. The following five articles were invited by the Editor.

A RESEARCH AND MANUFACTURING PHARMACY LABORATORY *

DWIGHT L. DEARDORFF

The new University of Illinois College of Pharmacy building (1) contains a research and manufacturing pharmacy laboratory that is used for the production of medicinals for an 800-bed research hospital and for a clinic load of more than 300,000 patient visits annually, for the instruction of senior students (2), and for the instruction and research of graduate students.

The facilities generally are analogous to those found in modern, well-equipped but small pharmaceutical manufacturing plants, and in the types of industrial pilot plants which deal with the development of dosage forms.

The total space amounts to more than 16,000 sq. ft. divided into about thirty-five rooms, if one itemizes such small enclosures as the aseptic transfer rooms. The rooms range in size up to 48' by 88'.

The types of areas are as follows:

I. Liquid and ointment production (two rooms, 3,500 sq. ft., Figs. 1,4,5).
II. Granulation and tablet production (four air-conditioned rooms, 1,600 sq. ft., Figs. 1,6,7,8,9).
III. Allergen production (two rooms, 600 sq. ft., Figs. 1,10).
IV. Production of autoclaved products (two rooms, 400 sq. ft., in the research hospital, adjacent to Central Sterile Supply autoclaves, Figs. 3,11).
V. Research, control, and sample storage (ten rooms, four are air-conditioned, 1,600 sq. ft., Figs. 1,12).
VI. Pilot plant area (principally in the basement, two rooms, 2,800 sq. ft., Figs. 1,2).
VII. Service areas:
Storerooms (four rooms, 4,000 sq. ft., Figs. 1,2,5).
Locker rooms (two rooms, 500 sq. ft., Fig. 1).
Offices and conference room (eight rooms, 1,500 sq. ft., Fig. 1).

Most of the equipment is readily portable and can be moved from room to room as needed. The few items which are bolted down or which for some reason are not at present readily movable are marked with asterisks in the several lists of equipment and include the two floor tablet presses, the 21-B Stokes mixer, the Fitzpatrick mill, the larger Lightnin mixer, and of course the stills and autoclaves. Most of these items could be made more readily movable if necessary. The usual equipment location is as listed. Stainless steel equipment is used where required.

* A contribution of a member of the Committee on Problems and Plans. Presented in part to the A.Ph.A., Miami Beach, Florida, 1955. The author gratefully acknowledges suggestions made by Dr. J. M. Dunbar, Assistant Professor of Manufacturing Pharmacy, College of Pharmacy, University of Illinois.

FIG. 1 FIRST FLOOR MANUFACTURING AREA, UNIVERSITY OF ILLINOIS

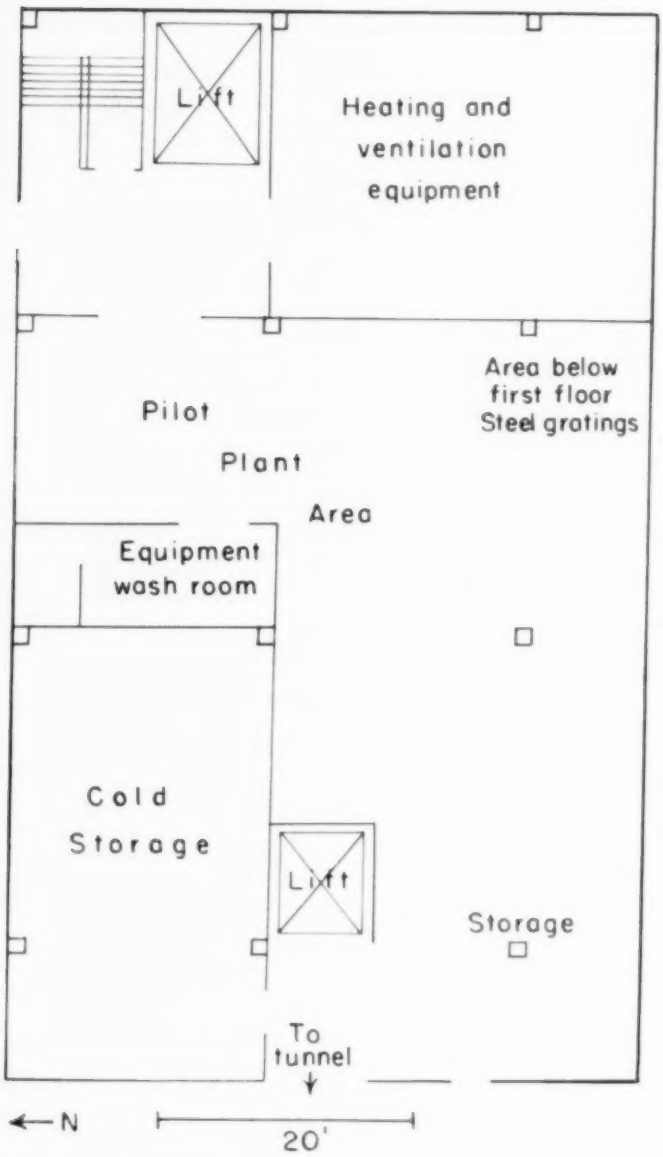

FIG. 2 BASEMENT MANUFACTURING AREA, UNIVERSITY OF ILLINOIS

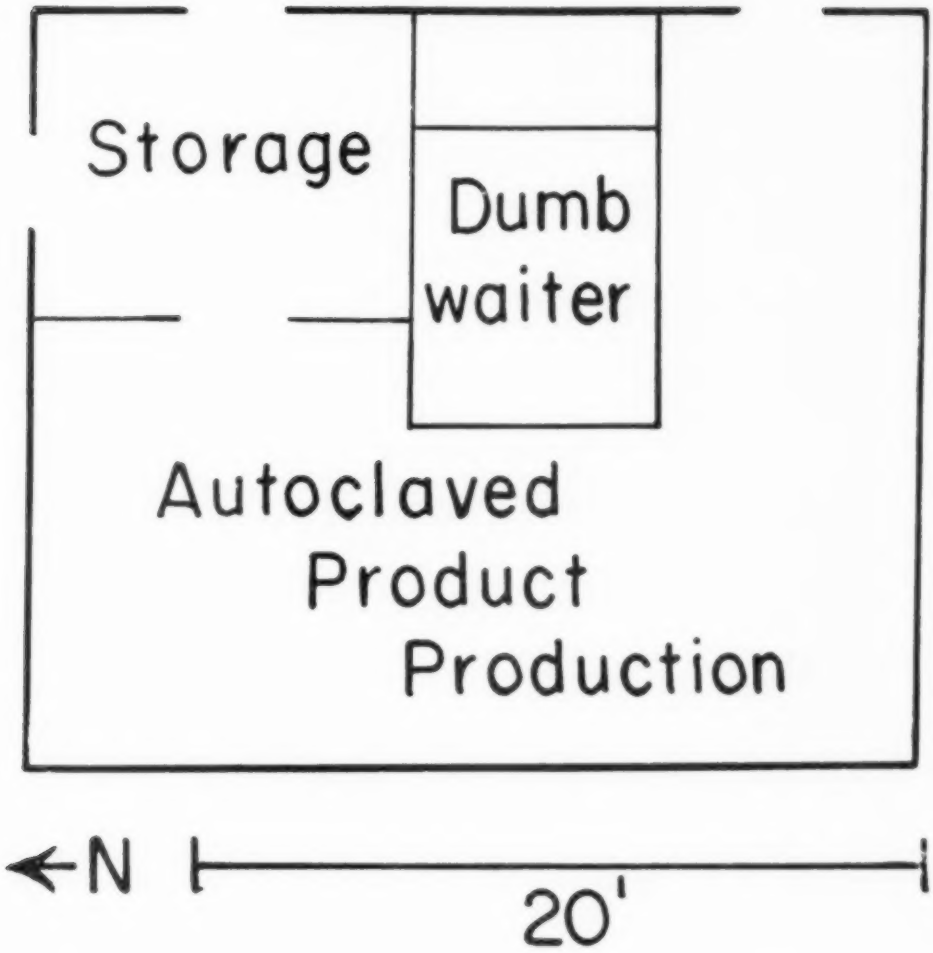

FIG. 3 FIFTH FLOOR MANUFACTURING AREA (HOSPITAL), UNIVERSITY OF ILLINOIS

FIG. 4 LIQUID AND OINTMENT PRODUCTION, UNIVERSITY OF ILLINOIS

FIG. 5 LIQUID AND OINTMENT PRODUCTION ROOM AND FINISHED GOODS STOREROOM, UNIVERSITY OF ILLINOIS

FIG. 6 GRANULATION PRODUCTION, UNIVERSITY OF ILLINOIS

FIG. 7 DRYING ROOM, UNIVERSITY OF ILLINOIS

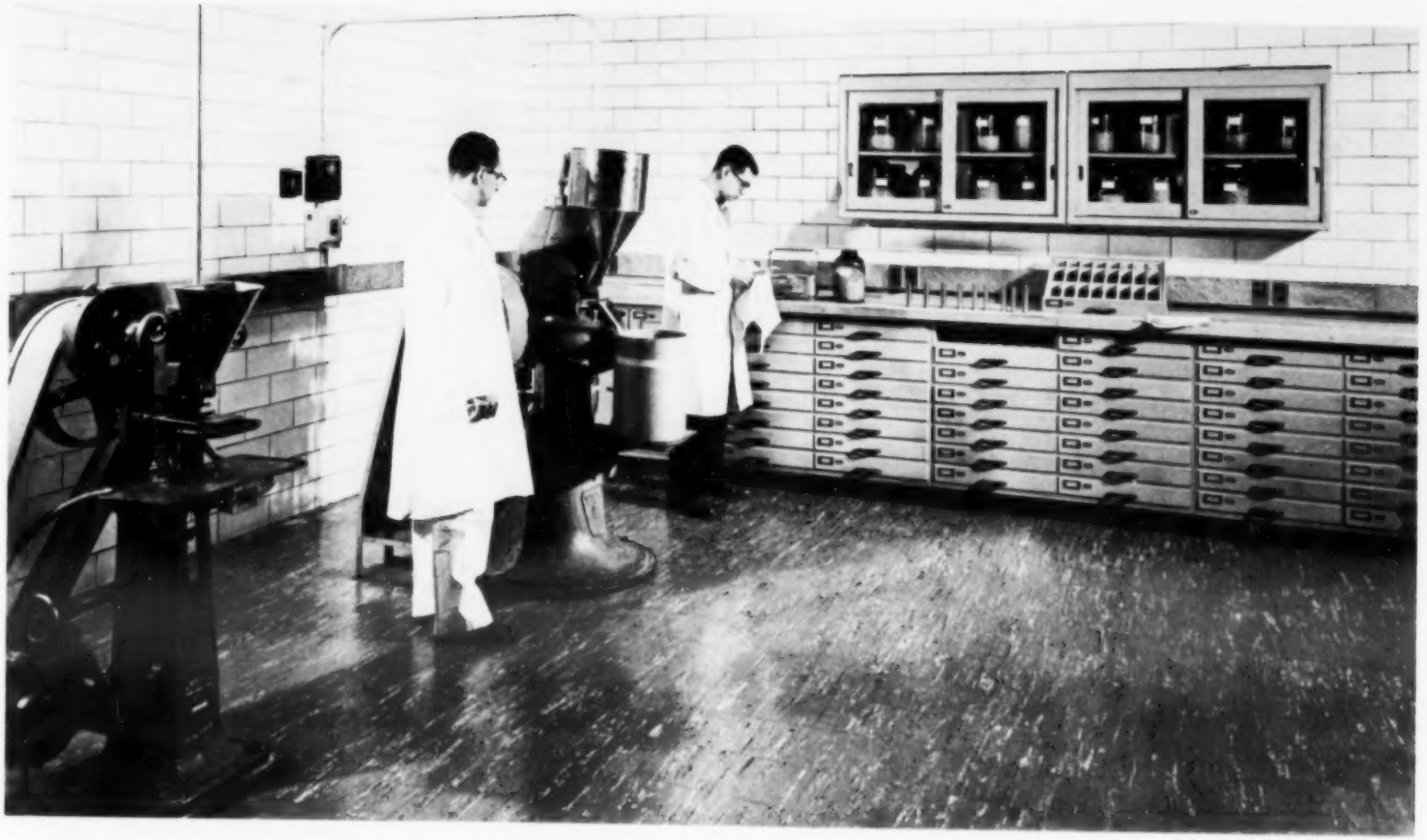

FIG. 8 TABLET COMPRESSION, UNIVERSITY OF ILLINOIS

FIG. 9 TABLET COATING, UNIVERSITY OF ILLINOIS

FIG. 10 ALLERGEN PRODUCTION, UNIVERSITY OF ILLINOIS

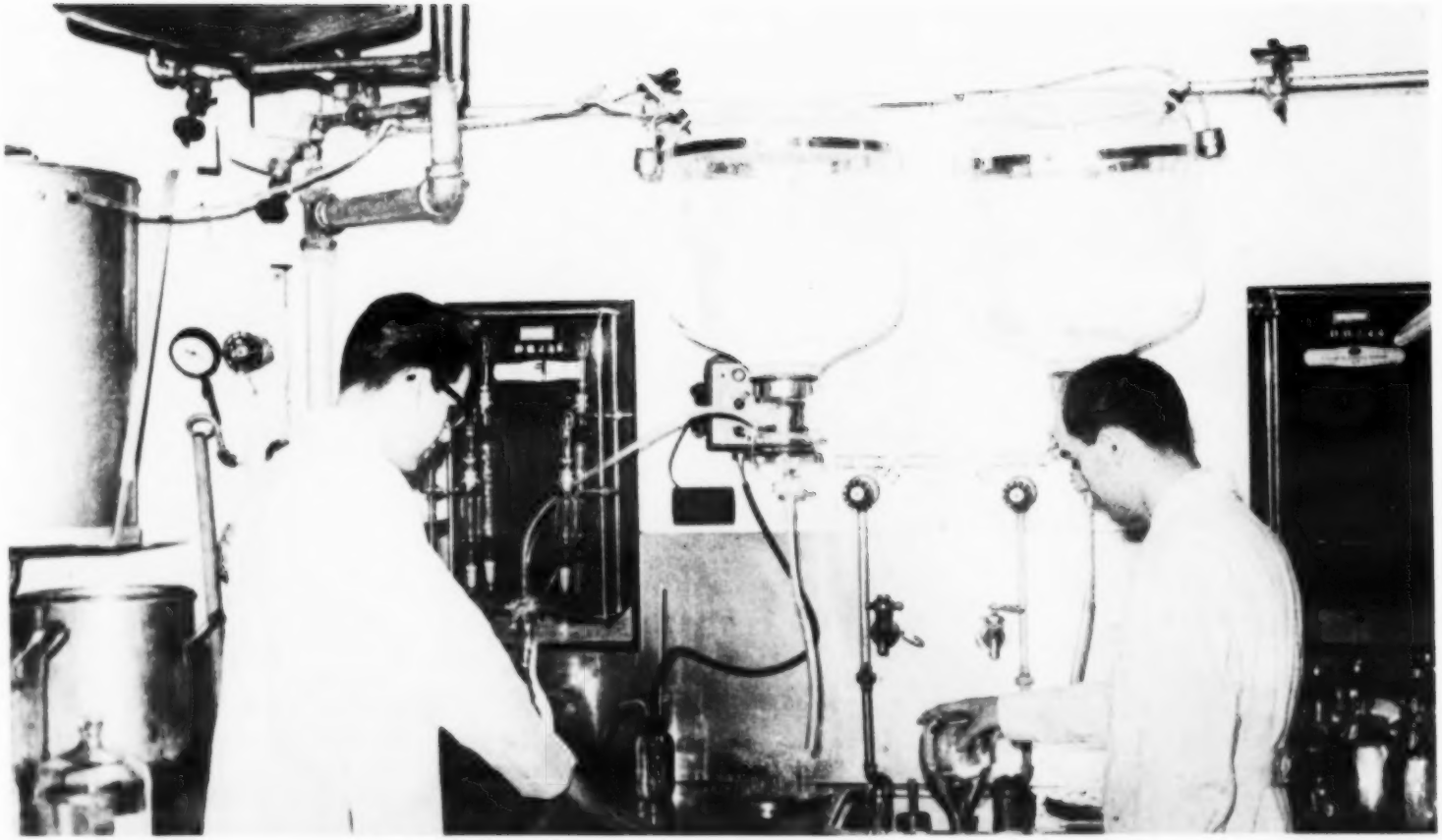

FIG. 11 AUTOCLAVED PRODUCT PRODUCTION, UNIVERSITY OF ILLINOIS

FIG. 12 CHEMICAL RESEARCH AND CONTROL, UNIVERSITY OF ILLINOIS

LIQUID AND OINTMENT PRODUCTION
(FIGS. 1, 4, 5)

The liquid and ointment production area contains:

A. Liquid mixing equipment:
   1. Lightnin mixer No. D-1* (⅓ H.P., Fig. 4).
   2. Lightnin mixer No. XP (1/20 H.P.).
   3. 20, 30, and 60 gal. stainless-steel mixing tanks (Fig. 4).
   4. Eppenbach Homomixer, laboratory size No. 1-H (¼ H.P.).
   5. Brookfield mixer, Model L.
   6. Osterizer.

B. Liquid milling equipment:
   1. Manton-Gaulin two-stage colloid mill, 2″ rotor size, No. LP (1½ H.P., Fig. 4).

C. A pressure filter:
   1. Ertel, two disc, 12″ (Fig. 4).

D. A steam jet for melting ointment ingredients.

E. Ointment mixing equipment:
   1. Reco four-speed planetary mixer Model B-422, with 12 qt. and 22 qt. stainless-steel bowls (⅓ H.P., Fig. 4).
   2. Hobart Kitchen-Aid mixer, Model K5-A.

F. Ointment milling equipment:
   1. Day Midget mill* with three water-cooled 5″ x 12″ rolls (Fig. 4).

G. Two steam-heated stills* for the preparation of distilled water from deionized water; each has a storage tank; one is a Barnstead No. SLO-2 still with a steam-heated, stainless-steel storage tank which can be held at 185°F. to prevent bacterial growth, the whole automatically controlled.

H. Toledo Floor Scale, Model 31-0851-GE, 75-Kg. capacity (Fig. 4).

The equipment washroom, which is part of the liquid-ointment production area, has a large double sink and an alcove with steam jets for cleaning such equipment as the portable, stainless-steel mixing tanks.

GRANULATION AND TABLET PRODUCTION
(FIGS. 1, 6, 7, 8, 9)

The granulation and tablet production area is air-conditioned and consists of the following rooms: granulation production, drying, tablet compression, and tablet coating.

A. The granulation production room (Figs. 1,6) is equipped for general processing of dry materials (grinding, mixing, sifting) as well as for preparing granulations.

The equipment can be listed under the following headings:

1. Grinding:
   a. Fitzpatrick hammer mill* Model A (Fig. 6).
   b. Abbe ball mills (Fig. 6).
2. Sifting:
   a. Universal sifter (Fig. 6).
   b. Cenco-Meinzer sieve shaker (Fig. 6).
3. Mixing:
   a. Stokes Model 21-AA mixer* (¼ H.P.).
   b. Stokes Model 21-B mixer* (1½ H.P., Fig. 6).

c. Patterson-Kelley Twin-Shell Blendor, No. LB-102 (1/20 H.P., Fig. 6).

4. Granulation:
   a. Colton No. 3-WG rotary wet granulator (1 H.P.).
   b. Stokes No. 43-A oscillating granulator (1 H.P., Fig. 6).

B. The drying room contains:
1. Stokes No. 38-B five-tray electrically heated oven* for drying granulations (Fig. 7).
2. Precision No. 1102 electric oven for drying such equipment as sieves and glassware (Fig. 7).
3. Thelco vacuum oven No. 31468.
4. Cenco moisture balance No. 26675.

C. The tablet compression room (Figs. 1,8) contains:
1. Single-punch tablet presses:
   a. Stokes Eureka.
   b. Stokes Model E* (¾ H.P., Fig. 8).
2. Rotary tablet press:
   a. Stokes RD-3* (2 H.P., Fig. 8).
3. A high-speed sensitive Roller-Smith balance for weighing single tablets for statistical quality control (capacity 500 mg.).
4. Tablet hardness testers:
   a. Monsanto.
   b. Strong-Cobb.
5. Tablet disintegration tester (Scientific Glass Apparatus Co.).

Special drawer space is provided for tablet press punches and dies.

D. The tablet coating room (Fig. 9) contains two coating machines, with coating pans of galvanized iron:
1. Colton Model BSC with 20″ coating and polishing pans (Fig. 9).
2. Colton Model 36 with 6″ and 8″ coating pans.

ALLERGEN PRODUCTION
(FIGS. 1, 10)

The area for allergen production has a chemical hood and a small room for aseptic transfer and contains the following equipment:

A. Soxhlet extractors.
B. Precision Vari-Heat multiple hot plate.
C. Waring Blendor.
D. Concentrator (by evaporation, Fig. 10).
E. Seitz pressure filters (bacterial).
F. Hydraulic press (Fig. 10).
G. Krebs stirrer, type NS3 (1/50 H.P.).
H. Klett-Summerson photoelectric colorimeter No. 4013.
I. International centrifuge Size 1, type SB.
J. Filamatic vial filler No. AB.
K. Precision incubator No. 1483.
L. Refrigerator.

PRODUCTION OF AUTOCLAVED PRODUCTS
(FIGS. 3, 11)

Production of sterile preparations (autoclaved formulations) other than allergens is located in the hospital adjacent to Central Sterile Supply, whose autoclaves it shares.

Its equipment includes:

A. A still* for the preparation of pyrogen-free water from single distilled water (Fig. 11).
B. A Fenwall flask filling unit* completely equipped with a wide assortment of automatic pipettes (Fig. 11).
C. Autoclaves* (in Central Sterile Supply):
   1. Wilmot Castle 24″ x 24″ x 48″.
   2. American Sterilizer 24″ x 24″ x 48″.
   3. Scanlon-Morris 24″ x 36″ x 48″.
   4. American Sterilizer 36″ x 42″ x 84″.
D. Aseptic transfer box (equipped with a GE 15 W germicidal UV lamp).
E. Toledo bench scale.
F. Precision electric oven No. 1250.
G. Filamatic vial filler Model AB-5.
H. Lindberg hot plate.
I. Mag-Mix magnetic stirrer.
J. Fritted glass filtration equipment.
K. Ampule sealer (Scientific Glass Apparatus Co.).
L. Gast pump (⅓ H.P.).
M. Barnstead Purity Meter Model M-2 (Fig. 11).
N. Fermpress vial cappers and decappers.
O. Dazor fluorescent lamp Model UL-M-270.
P. Heyer Lettergraph Model 60.
Q. Vari-Line printing kit.

RESEARCH AND CONTROL
(FIGS. 1, 12)

Research and control may of course be carried out in almost any location depending on the facilities needed. If convenient, this work is done in the three 20′ x 20′ rooms comprising the basic research and control area. Four small laboratories in the air-conditioned area are also specifically assigned to research. In addition two small rooms are available for the storage of research and control samples. The three principal research and control rooms and the equipment usually located in them are as follows:

A. Chemical Research and Control (Fig. 12):
   1. Coleman spectrophotometer Model 14 (Fig. 12).
   2. Kern polarimeter (Fig. 12).
   3. pH Meters (Beckman No. H-2, Fig. 12, Gamma No. 2000, Macbeth Model A).
   4. Fisher Unitized Constant Temperature Bath.
   5. Bronwill Constant Temperature Circulator.
   6. Chainomatic balance.

This room is equipped with three chemical hoods, two unusually wide (5′) and one unusually high (6′). All hoods except the 6′ high walk-in hood are equipped with safety-glass windows and steam-heated drying cupboards.

B. Physical Research and Control (Fig. 1):
   1. Photovolt reflectance meter No. 610.
   2. Cenco-du Nouy precision interfacial tensiometer.
   3. Brookfield viscometer Model LVF.
   4. Spencer petrographic microscope.
   5. Carver hydraulic press.
   6. Fisher Infra Rediator.
   7. Fisher-Botts particle size apparatus.
   8. Baldwin-Hamilton Model SR-4 strain gages and strain gage kit.

C. Sterile Products Research and Control (Fig. 1):
   1. Bacterial Filters:
      a. Ertel, 7⅞", stainless steel, double disc, No. 42 (Fig. 7).
      b. VirTis, with 8" fritted glass candle, No. F-1830-1-X.
      c. Bush, with fritted glass discs, single and double cylinder types.
      d. Millipore (cellulosic membrane type).
      e. Morton.
      f. Swinney.
      g. Seitz.
   2. Other equipment:
      a. Sigmamotor rubber tubing pump No. T-6 driven by a Zero-Max torque convertor Model 142X (⅙ H.P.).
      b. Filamatic vial filler Model AB-5.
      c. Aseptic transfer box (equipped with a GE 15 W germicidal UV lamp).
      d. Presto 16 qt. pressure cooker No. 7-S.
      e. Labline magnetic stirrer No. 1270 with hot plate attachment.

PILOT PLANT
(FIGS. 1, 2)

The pilot plant area is located principally in the basement (Fig. 2). It is unequipped as yet. It includes a space about 20′ x 25′ on the first floor. The floor of this first-floor space is constructed of steel gratings which may be removed for the erection of equipment which is more than one story in height. The ceiling over the grating area bears a monorail system and carriage.

SERVICE AREAS
(FIGS. 1, 2)

The locker rooms are more than adequate for four women and sixteen men. The two larger storerooms are used for raw materials and finished goods. The other major storerooms are used for alcohol and other flammable liquids, and for cold storage. The latter 20′ x 35′ room is located in the basement (Fig. 2). The storeroom for flammable liquids is equipped with fire doors and a C-O-Two Fire Extinguishing System (Fig. 1). This room has brick, fire-resistant walls, exterior "blow-out" windows, and scupper drains leading directly to the outside of the building just above ground level. A Yale and Towne electric truck Model M467-48, 4000 lb. capacity (Fig. 4), is used for major stock transfer including taking goods through the tunnel which connects the basement of the College of Pharmacy building and the University of Illinois Research and Educational Hospitals.

The room designated as a liquid-ointment-tablet production laboratory and office (Fig. 1) is used for preparing production work sheets from the master

formula cards filed there, and for preparing small production batches. Necessary reference books and catalogs are placed in convenient locations, in this office, in allergen production, in the storeroom records area, and in the conference room and the nearby offices.

The conference room (Fig 1) is one of the most useful rooms in the entire area. In addition to part of the reference library, it contains many samples of the laboratories' production and research formulations and of commercial preparations. It also contains displays of records of production, in-process quality control, and statistical quality control; of new equipment; and of containers and closures. In addition to its use for conferences it is used for small classes such as the elective courses in manufacturing pharmacy for seniors, and for graduate courses in pharmacy.

Four of the display windows on the main corridor of the first floor are used for displays of manufacturing pharmacy processes. The various samples and displays are of considerable value in teaching.

GENERAL FACILITIES

The laboratory and production areas are equipped with gas, compressed air, cold water, hot water, deionized water, 5 lb. steam, and 110 and 208 volt a.c. Steam is available at suitable locations at 15 lb., 60 lb., and 125 lb. pressures. Pyrogen-free distilled water is prepared as needed by distillation of deionized water (pharmacy building) or of single-distilled water (hospital).

All rooms receive filtered, circulated air. The rooms designated as air-conditioned also have temperature and humidity control. Most of the interior laboratory walls contain clear glass panels giving good visibility and good light distribution from room to room. The columns are spaced at 20′ by 25′ intervals.

Only a few rooms used for the production of autoclaved products and for storage of flammable liquids have outside windows. Floors are cement (storerooms, liquid-ointment production, pilot plant), or asphalt tile on cement. The floors of the liquid-ointment production and pilot plant areas, and of their equipment washrooms, are waterproof and drained. Walls are plaster (offices), movable metal (Hauserman, between laboratories), glazed structural tile (liquid-ointment production area, locker rooms), and cement block (storerooms, pilot plant). Benches are of wood construction with the exception of metal in the area for the production of autoclaved preparations. Bench tops are stainless steel (for sterile work), Formica, wood (tablet production area), soap stone, or impregnated transite, as needed.

SUMMARY

The equipment and facilities of a new research and manufacturing pharmacy laboratory are described.

REFERENCES

(1) Serles, E. R., *Am. J. Pharm. Ed.*, 20, 158 (1956).
(2) Deardorff, Dwight L., *Ibid.*, 18, 422 (1954).

THE PLACE OF MANUFACTURING PHARMACY COURSES IN THE PHARMACY CURRICULUM

V. N. BHATIA

An examination of the various current and proposed five year courses indicates that there is considerable difference of opinion whether manufacturing pharmacy should be a required or an elective field of study. To resolve this question intelligently, one should first determine what the student is expected to learn from courses in this area. In other words, what are the aims and objectives of these courses?

If one feels that the objective of manufacturing pharmacy courses is merely to teach the student how to prepare pharmaceutical products on a large scale, then it is very possible to present arguments to show that this in itself need not be a required subject in a curriculum aimed at producing sound retail pharmacists.

There is, however, another point of view, that manufacturing pharmacy should be taught not so much for the previously stated reason but as a tool for familiarizing the student with many of the basic dosage forms that he will be expected to handle, and to give him a better understanding of the pharmacy of these products. In order to achieve these objectives, the State College of Washington, School of Pharmacy, plans to teach manufacturing at two levels:

1. A Required Elementary Course.
2. An Elective Advanced Course.

THE ELEMENTARY COURSE

To clarify the thought behind the elementary course, let us take the example of our courses in pharmaceutical chemistry. In our pharmacy curricula we spend a considerable amount of time, and rightly so, in the teaching of organic and pharmaceutical organic chemistry. We do not do this with the idea of having the pharmacist become a synthetic chemist, an authority on structure-action concepts, but we do so in order to give him a broad understanding of the pharmaceutical chemistry of the many products that he handles. We do this so that he may have a thorough comprehension of his materials, may improve his ability to advise physicians wisely, and may evaluate new products as they come before him.

Now surely no one questions this emphasis on chemistry. But it seems that it is just as important that a pharmacist understand the pharmacy as well as the pharmaceutical chemistry of many dosage forms such as tablets and injections. In the past and even today we spend a considerable amount of time acquainting the student with the pharmacy of such products as syrups, elixirs, and tinctures. But when it comes to those dosage forms which are essentially manufactured items, we often tend to give a very cursory training—often entirely unsupported by laboratory work, even though in many cases these dosage forms constitute a very large part of the products that a pharmacist may be called upon to dispense.

If we accept this need for familiarizing students with the pharmacy of all types of dosage forms including those encountered only as manufactured items, then the answer seems to be to require an elementary course in manufacturing. In addition, if we accept this philosophy that the basic emphasis is not to be

so much on manufacturing processes, but on dosage forms and their pharmacy, then the obvious place for such a course is in the same year in which beginning pharmacy is taught.

To illustrate this idea I might explain the approach that we plan to use at the State College of Washington. At present we require two semesters of beginning pharmacy—four hours in each semester calling for two lectures and two three-hour laboratory periods a week. This course is similar to many other courses of its type taught in most institutions, and is aimed at teaching the student some of the fundamental principles of pharmacy, the terminology of pharmacy, and the dosage forms. The laboratory work calls for the preparation of various products such as syrups, solutions, elixirs, tinctures, ointments, emulsions, and tablet triturates. In the five year curriculum we shall reduce beginning pharmacy to a four-hour course to be taught in the first semester followed in the second semester by a three-hour course in beginning manufacturing pharmacy. This new course would call for two hours of lecture and one three-hour lab period a week. By doing this we feel that we will be eliminating a great deal of repetition in the laboratory work in beginning pharmacy and including a lot of essential material in the second-semester course.

Actually these courses will not be separate entities, but will be closely coordinated both in the lectures and in the laboratory. The reduction in the laboratory work in beginning pharmacy will in many cases not be as great as it may first appear, as some of the work will be done in the second-semester course. Tablet triturates, for instance, will be made along with two simple types of compressed tablets in the second-semester manufacturing course, and there will be no elimination of the essential lecture material in beginning pharmacy. It may appear to some that, if this reasoning is to be followed to its logical conclusion, there is no need for separating the courses in beginning pharmacy and beginning manufacturing pharmacy. The latter may be incorporated in the former. That may well be; we have not felt that we could do so because of the nature of our laboratory layout. Some other colleges may find this entirely feasible.

For those who fear that this type of an arrangement may lead to insufficient grounding in some of the fundamental and theoretical aspects of pharmacy, it should be pointed out that in most cases in the five year course beginning pharmacy will be taught at a junior level, and we will be dealing with students who have had two years of college work and have completed most of their work in chemistry, physics, and pharmaceutical arithmetic. It will not be necessary to start out the beginning pharmacy course with the teaching of the apothecary and metric systems, specific gravity, pH, and a variety of other fundamental concepts which the students will have already learned. In addition it will not be necessary to explain many chemical reactions and terms that are used in the lecture. For instance, if the instructor says that sugar is used as an antioxidant in such and such a preparation, the student will be able to understand this statement on the basis of his previous training, and it will not be necessary to take a great deal of time to explain the chemistry involved. This saving of time in lectures may well be used to increase greatly the time devoted to parenteral solutions, tablets, and similar topics. The same applies to the laboratory work. The students will have learned much of their laboratory techniques in their chemistry courses, and it should not be necessary to start out by saying, "This is a filter paper."

I have said earlier that in a beginning or elementary manufacturing course the emphasis should be on the understanding of the pharmacy of dosage forms. That does not mean that students will not learn any techniques. Obviously, one cannot work in a laboratory without learning techniques, but a detailed study of techniques belongs in a more advanced manufacturing course. If this is kept in mind, it would be possible in an elementary course to concentrate on those preparations, such as solutions for injections, which are not normally covered in a traditional beginning pharmacy course. But it should be enough that he learns fundamentals for preparing a sterile solution without going into the relative merits of, for example, the Fenwall System and its comparison with other systems. I am not saying that one or two ointments may not be made using an ointment mill, or that one or two solutions may not be made, but at this level and in this type of course, it does not make much difference to the training of a student whether he makes a solution by stirring with a glass rod in a 10-cc. beaker or with an outboard motor in a 100-gallon tank.

THE ADVANCED COURSE

For the purpose of teaching manufacturing pharmacy as such, and by that I refer to manufacturing techniques, pharmaceutical machinery, and control procedures, there needs to be a separate course which may be taught in the fifth year. There are two schools of thought on whether this should be an elective or a required course.

We propose to offer an elective for those who plan to go into manufacturing, hospital pharmacy, or large professional stores where such knowledge may be needed. There are others who feel that it should be required. An important consideration that enters into this is that of an outlet for the manufactured products. Colleges of pharmacy that are associated with medical schools and large teaching hospitals may find it considerably easier to have a course of this type. Others may find it too expensive and wasteful in terms of materials. However, seen in the light of a required beginning course, the advanced or fifth-year course may or may not be elective without jeopardizing the students' training. Obviously all schools will not have identical curricula, and as long as the need for fundamental training is satisfied, different schools should be free to emphasize one or another area of pharmacy depending on their regional needs, facilities, and faculty.

There is a group that feels that colleges of pharmacy should not offer work in manufacturing. I have heard this view expressed by individuals connected with the pharmaceutical industry. Their reason for this is that it leads to more and more products being made on a large scale in hospital pharmacies and certain professional stores, and they feel that in many cases this leads to the use of inferior and unreliable products. This reasoning is certainly self-contradictory. We cannot stop hospital pharmacies and others from manufacturing by not teaching the students. The answer to problems of this type lies not in abandoning the training but in improving it.

So far as subject matter is concerned, we need not so much a new curriculum as we need a new attitude toward the curriculum.

Glenn L. Jenkins, Am. J. Pharm. Ed., 8, 647 (1944)

MANUFACTURING PHARMACY – COURSE CONTENT

ALBERT M. MATTOCKS

The course in manufacturing pharmacy at the University of Michigan College of Pharmacy is offered as a one-semester subject intended as a complete unit for undergraduates in retail pharmacy. It is followed by one or more advanced courses for graduate students or undergraduates with primary interest in industrial or hospital pharmacy. Since introductory manufacturing is of chief concern at the moment, this article is confined to subject material of the one-semester course with two lecture hours and one three-hour laboratory per week.

In designing this unit it was kept in mind that it is not intended to make qualified technicians of the students nor to give them a working knowledge of the subject. Rather, it is aimed at presenting an understanding of manufacturing such as is judged to be essential to a retail pharmacist and which might serve as a basis for more advanced training for students interested in industrial pharmacy.

Objectives of the course might be stated as follows:

(1) To acquaint the student with the development of the pharmaceutical industry and the part it has played and continues to play in medical progress.

(2) To make the student familiar with the more common processes of manufacturing pharmacy.

(3) To have the student learn more about the nature and characteristics of manufactured products.

(4) To have the student acquire an appreciation of the need for, nature of, and costs of adequate control.

(5) To have the student learn of the legal problems and distribution problems of the pharmaceutical industry.

LECTURE OUTLINE

1. Topic: **Objectives of the course in manufacturing pharmacy.**
   This lecture is conducted as a discussion. It serves to clarify the nature of the course for the student and give him direction for study.

2. Topic: **Handling of materials in the manufacturing plant.**
   Assignment: *University of Michigan Manufacturing Manual.*
   This is the only lecture in the one-semester course devoted entirely to control. Generally control is discussed along with specific processes. In this lecture the general philosophy of control is presented, and materials handling in the University laboratory is discussed in detail.

3. Topic: **Movie on pharmaceutical manufacturing.**
   A film titled *In These Hands* produced by Eli Lilly and Co. is shown to give the student an over-all view of a large manufacturing plant. This enables the student to see the number of relatively unskilled persons involved in the processes, the size of the different departments, and the number and variety of products manufactured. This proves helpful to the student in recognizing the scale-down of equipment and batch sizes in the University laboratory. Thus, he can understand better the discussion of controls and materials handling. Although many of the students enrolled in this course may have actually visited manufacturing plants, this

film is still of value since it serves to illustrate to the students features of manufacturing, such as those mentioned above, which serve as a basis for discussions. The film lasts about thirty minutes allowing sufficient time for discussion.

4. Topic: **Development of manufacturing pharmacy.**
   Assignment: 1. Kremers and Urdang, *History of Pharmacy*, 2nd ed., pp. 427-440.
   2. F. O. Taylor, *J. A. Ph. A.* 4, 468-481, 1915.
   3. J. F. Bohmfalk, Jr., *Chem. Eng. News* 31, 3052, 4182, 5006, 5186, 5356, 1953.
   4. *The Sterling Story* (library reference shelf).
   5. *The Pharmaceutical Industry*, McKesson & Robbins (library reference shelf).

   The history of manufacturing pharmacy in the United States is presented, with reasons for growth being emphasized. The lecture is concluded with a discussion of the rapid growth of the pharmaceutical industry since 1930.

5. Topic: **Tablets: historical, types of tablets.**
   Assignment for this and subsequent lectures:
   1. *Remington's Practice of Pharmacy*, 10th ed., pp. 1378-1393.
   2. Little and Mitchell, *Tablet Making.*
   3. Silver and Clarkson, *Manufacture of Compressed Tablets.*
   4. R. C. White, *J. A. Ph. A.* 9, 788, 1920.
   5. *American Pharmacy*, Vol. 2, pp. 213-233.
   6. Clarkson, *Tablet Coating.*
   7. *U.S.P. XV*, pp. 819, 945, 936-938.

   The development of the tablet process is discussed. Advantages of tablets as a dosage form and the various types of tablets made are brought out in discussion. Packages of commercial products are presented to illustrate types of tablets.

6. Topic: **Tablets: mixing and granulating.**
   Mixing is discussed only in its relation to tablet making. Granulating is discussed in detail, including types of binders, their preparation, advantages, and disadvantages.

7. Topic: **Tablets: drying and compression.**
   Drying is discussed only with respect to drying of granulations. Compression is discussed in detail, including the tablet machine.

8. Topic: **Tablets: lubricants and disintegration.**
   Both subjects are discussed in detail, including speculation as to their mode of action. References to recent articles on these subjects are given in class.

9. Topic: **Tablets: weight variation, hardness, capping, sticking, and picking.**
   Weight variation and its relation to tablet and granule size are discussed. Reasons for hardness tests and the various types of tests are presented. Cause for and corrections for tableting troubles are included.

10. Topic: **One-hour quiz.**

11. Topic: **Tablet coating.**
    Reasons for coating tablets are discussed. The process is described in detail. Commercial products are shown to illustrate types of coatings.

12. Topic: **Tablet coating: special types of coatings.**
Enteric, protective, and delaying coatings, granule coatings, compression coating, and layered tablets are discussed and illustrated with commercial products.

13. Topic: **Fluid mixing.**
Film: *Fluid Mixing* produced by Mixing Equipment Company.
The process of fluid mixing is discussed including effect of propeller type, speed, and position. Relationship of mixing equipment to material characteristics is presented.

14. Topic: **Filtration.**
Film: *Diatomaceous Filter Aids* produced by Johns-Manville.
Use of industrial filters and filter aids is discussed.

15. Topic: **Dispersions: ointments, suspensions, and emulsions.**
Methods and equipment for manufacture and control of these products are described.

16 & 17. Topic: **Parenteral solutions.**
Assignment: 1. *Remington's Practice of Pharmacy,* 10th ed., pp. 256-272.
2. Brewer, *Proc. ADMA,* pp. 208-215, 1948.
Methods of manufacture, control procedures and problems are presented.

18. Topic: **One-hour quiz.**

19 & 20. Topic: **Antibiotic and vaccine manufacture.**
Film: *Polio Vaccine Production* produced by Eli Lilly & Company.
Production process and control for antibiotics are described, dealing chiefly with penicillin but showing where streptomycin, tetracycline, and erythromycin differ. Production of polio vaccine is described in detail.

21. Topic: **Food, Drug and Cosmetic Act—historical.**
Assignment: H. A. Toulmin, *A Treatise on the Law of Foods, Drugs and Cosmetics,* Foreword, Chaps. I, II, and III.
The 1906 Act and its weaknesses are described. Events leading up to passage of the 1938 act are reviewed.

22. Topic: **Food, Drug and Cosmetic Act—misbranding and adulteration.**
Assignment: *Federal Food, Drug and Cosmetic Act and General Regulations for its Enforcement.* (Available at local book stores.)
Misbranding and adulteration provisions are discussed.

23. Topic: **Food, Drug and Cosmetic Act—New Drugs.**
The New Drug section of the act, new drug applications, recall programs, and clinical trials are discussed.

24. Topic: **Federal Trade Commission Act.**
Assignment: H. A. Toulmin, pp. 817-876.
The Wheeler-Lea Amendment and the procedure for FTC action are discussed.

25 & 26. Topic: **Patents and trade-marks.**
Assignment: 1. *Principles of Patent Law,* A. W. Deller, pp. 7-135.
2. *Rules of Practice in Trade Mark Cases,* U.S. Patent Office.
Development of patent laws and practices of the United States is reviewed. Provisions of the laws and patent and trade-mark practices in the pharmaceutical industry are presented.

27. Topic: **One-hour quiz.**

28. Topic: **Duplication and substitution.**
Assignment: Library assignment.
The class is divided into pro and con, each student being asked to read pertinent articles on the subject and bring to class a list of arguments for his side. The discussion is conducted so as to develop viewpoints of retailer, manufacturer, and physician.

29. Topic: **Organization of manufacturing plants. Personnel problems and communication. Pharmaceutical manufacturers organizations.**
A typical organization diagram is presented. Routes of communication within a plant are discussed. Development and nature of the APMA, ADMA, TGA, PMAA are described. The Combined Contact Committee is described.

30. Topic: **Sales of manufactured products.**
Costs of sales, detailing, planning the introduction of a new product and mark-up are discussed.

31. Topic: **Market research.**
Assignment: Aries Associates pamphlet: *Market Research in the Chemical Industry.*
The nature and value of market research is discussed.

32. Topic: **Modern trends in manufacturing pharmacy.**
New products and processes are described.

The rather large proportion of lecture time spent on tablets may be open to criticism. However, tablets have not been studied in detail in any previous course and require a complete discussion of physical principles of the process as well as descriptive information and manufacturing problems. Tablets also are the most commonly used dosage form and as such deserve more time. It should be borne in mind that the general subject of tablets is a broad one, including many different types such as lozenges, tablet triturates, coated tablets, and layered tablets.

More lectures might be devoted to parenterals since the students have very little prior information on this subject. It will be noted, however, that three of the sixteen laboratory periods are devoted to parenterals. More lecture time might be given to dispersions, as well, since one lecture period is hardly sufficient to cover ointments, emulsions, and suspensions even though they are generally covered rather thoroughly in principle in earlier courses. The amount of time to devote to each topic must be decided by each instructor after consideration of material covered in previous courses.

One might question the lecture time spent on the Food, Drug and Cosmetic Act. This topic is of particular importance to anyone who wishes to understand the problems of development and marketing of drugs. The treatment given the Food, Drug and Cosmetic Act in this course is primarily from the standpoint of the manufacturer and emphasizes parts of the Act not stressed in other courses such as pharmaceutical law.

It should be noted that a large portion of the lecture is devoted to topics other than manufacturing processes. This is in keeping with the previously stated objectives. The retail pharmacist is not expected to be skilled at manufacturing processes, but he is expected to recognize problems of the manufacture and marketing of drugs. In practice he may never make a tablet, but he will be confronted daily with patented and trade-marked products. He will have oc-

casion to handle new drugs and drugs still in clinical trial. He should know what is required for the manufacturer to move a drug from the laboratory bench to the market as well as how a drug is qualified to be "over-the-counter." He should know why mark-ups must be high in some cases and not in others. Thus, by having considerable emphasis on such topics, it is believed that the course satisfies a real need of the retail pharmacist.

LABORATORY INSTRUCTION

Laboratory for manufacturing pharmacy is quite different from most laboratory instruction. It is not possible to have sufficient duplication of equipment to have all, or even a large segment of the class, perform a single experiment at the same time. Nor would this be desirable, since such a system would convey to the student no understanding of plant problems.

The laboratory in physical setup and operation is organized as much like a manufacturing plant as is possible. Batch cards are written for the product by the Control Department, materials are weighed and checked by the Crude Stock Department, granulations are prepared in the Granulating Department, etc. Materials in process are transferred from one area to another by the Control Department which checks records and sampling at the time of transfer. A department is more a designation of function than of a separate work area, some departments consisting of no more than a given laboratory bench, others a section of a laboratory or a separate room.

The student is reassigned to a new area once he has completed a given phase of the work in a given department. Records are kept of the student assignments as well as the work performed during each assignment. Thus, a student may serve in the Granulating Department for one period to prepare a relatively simple wet granulation and later be assigned again to the same department to work with a different and more difficult formula. In the sixteen laboratory periods it is possible for the student to gain experience in each of the general processes. The time spent in each area may be illustrated best by showing a typical schedule for one student:

Period	Department	Work Done
1	Ointment	Prepared 10 per cent zinc oxide ointment on plate mill.
2	Tablet	Compressed calcium sulfate tablets on a single-punch press.
3	Control	Prepared one batch card, handled materials transfer.
4	Crude Stock	Weighed materials for three batches.
5	Parenterals	Prepared sterile area and equipment.
6	Parenterals	Filled ampuls with aseptic technique.
7	Parenterals	Performed leaker test, sterility test, visual inspection, volume test.
8	Liquids	Prepared and filtered elixir of phenobarbital.
9	Tablet	Compressed aspirin compound on rotary press.
10, 11, 12	Tablet	Coated tablets.
13	Control	Performed weight variation, disintegration and hardness tests.
14	Granulating	Mixed aspirin granulation and granulated phenobarbital tablets.
15	Ointment	Prepared salicylic acid ointment on roller mill.
16	Tablet	Coated tablets by compression.

Not every student does exactly the same things in the laboratory, but by proper scheduling it is simple to see that all get practice in each general operation. If a variety of products is produced, they learn by observing others and gain more than if the same set of products is made time after time.

Essential to this type of laboratory arrangement is constant supervision by a competent teacher. It is important to show the students construction details and methods of operation of the machines as well as point out peculiarities of the process and product they are working with. Since students are at different tasks, it is necessary for the teacher to "make the rounds" of the departments constantly during the laboratory period.

The laboratory instruction would be far less valuable without control. In this college control of manufactured products and raw materials is the responsibility of the professor of analytical pharmaceutical chemistry. He supervises the collection of samples, the analytical procedures, and releases the product for shipment. The actual analyses are performed by a graduate assistant appointed to this task. Control records are filed both in the manufacturing and control laboratories and are available for the students to see. No raw material can be used without having been assayed and approved by control. An "Approved for Use" sticker must be placed on the container before the stock department can place the material on the shelf for use. Frequently a control approval must be given a product in process before the process can be completed. All finished products must be approved before they can be packaged for shipping. The students thus are aware that their products are tested thoroughly before use. Failure of a product to pass control is pointed out and discussed with the student. Usually reasons for failure can be found. This not only points out faulty technique to the student, but also emphasizes the care required to produce a satisfactory product and the value of good control.

The control process should be looked upon as an essential part of a manufacturing laboratory. It should be applied to every raw material and every product whether or not the product is to be used. A student cannot understand or appreciate manufacturing without having sensed the watchful eye of control constantly looking over his shoulder. The awareness of the need for checks and records and the ability to recognize possible sources of error which are learned in this manner are of certain value to every pharmacist, wherever he practices his profession.

The selection of products to be made in the laboratory is of importance. In this college the manufacturing laboratory has teaching and research as its sole objectives. Products made which can be used by the University Hospital or Student Health Service are sold at cost. Whenever it is possible to illustrate the principles involved, and at the same time produce a product that can be used, this is done. In the opinion of the author, however, the value of having an outlet for products is often overrated. One can select products for which there is no outlet to illustrate the principles to be taught and yet involve little cost. If control is still rigidly exercised, as it should be, the student loses little by not having his product used. The college loses little since the materials are not excessively costly, and it saves time of the teacher who must spend a considerable amount of time having rejected batches of products reworked, seeing that products are properly packaged for shipping, etc. The student gains a great deal, for now he can undertake the manufacture of more difficult products and can work with the types of products best suited to his stage of learning. From pure-

ly a philosophical viewpoint, when the teacher has the clear aim of selecting products which offer greatest opportunity of learning without consideration for production outlets, he is free to teach the laboratory in the best way he knows. The result is more enthusiasm, both in teacher and in student.

The course in manufacturing pharmacy as described in this article has been rather successful in achieving its objectives. Its success is believed to be due primarily to two concepts:

1) The lecture material presents a broad view of industrial pharmacy.
2) The laboratory simulates a plant operation.

It is likely that considerable change can be made in detail of lecture and laboratory to suit personnel and equipment, but as long as these two concepts are retained the course will be of value.

Too often the undergraduate curriculum is designed as an end in itself—a practical education planned to turn out the graduate as a trained clerk. There has been little organized effort to inform the best undergraduate students in pharmacy about the purposes and opportunities of graduate study.

Glenn L. Jenkins, Am. J. Pharm. Ed., 9, 566 (1945)

MANUFACTURING PHARMACY CONTROL

C. BOYD GRANBERG

The offering of a course in manufacturing pharmacy, at either the undergraduate or graduate level, assumes, in my opinion, the responsibility of complete training in this field. But a survey of pharmacy college catalogs reveals that this assumption may be erroneous. Of those institutions listing manufacturing pharmacy as a part of their curriculum, both undergraduate and graduate, required or elective, a great majority make no mention of control—qualitative, quantitative, statistical, or other. We can suppose, then, that this aspect of manufacturing pharmacy is either not presented, or is integrated throughout the course without being mentioned specifically. I am inclined to think that the first alternative prevails.

Since the first responsibility of every drug manufacturer, whether it be an individual pharmacist, a college laboratory, or a corporation, is to insure the reliability, accuracy, and integrity of his product, it becomes imperative to check the quality of each item before it is released. This is the function of control.

Quality control in pharmaceutical manufacturing implies much more than merely checking for accuracy as to identity and specifications of a product. It embraces these plus the areas of inspection and sampling; equipment; packaging control, including containers and closures, packing materials, fill, and labeling; drug and chemical purchasing, sales, and shipping department record systems; sanitary standards; returned goods; regulations of the Federal Food, Drug and Cosmetic Act, the Federal Caustic Poison Act, the Federal Insecticide, Fungicide and Rodenticide Act, and perhaps others.

Although there is a difference of opinion among teachers of pharmacy as to whether manufacturing pharmacy should be taught at the undergraduate level, the fact is, the undergraduate does receive this training in several colleges of pharmacy in the United States. Where, how, when, and to what degree should we offer manufacturing pharmacy control?

It is my opinion that the material should be offered as a lecture-laboratory course at a dual undergraduate-graduate level. In some institutions, because of a lack of time, space, or prerequisities, the scheduling of such a course might not be possible at the undergraduate level. The extended curriculum may overcome these difficulties. Where the above situations do occur, or where the problem of large classes or no outlet for manufactured products exists, the course would become, of necessity, mere theory.

At the undergraduate level, acquiring the necessary prerequisites to the course outlined below may necessitate its being scheduled either in the fourth collegiate year of a (0-4) program or the fourth or fifth year of the extended curriculum. It is generally accepted that, to be eligible for enrollment in a course in manufacturing pharmacy control, a student should have successfully completed the courses of introductory pharmacy, pharmaceutical calculations, pharmaceutical preparations, general inorganic chemistry, qualitative analysis, general organic chemistry, and quantitative analysis. If the control course is to contain discussion and practice in statistics, college algebra and calculus also may be desirable prerequisites.

A course in manufacturing pharmacy control should carry three or four semester hours of credit (four hours if with a laboratory) and should cover the material outlined below.

Manufacturing Pharmacy Control

Four Credit Hours/One Semester

Three Lectures and Three Hours Laboratory/Week

Lecture Outline

I. Duties, responsibility, and authority of control department.
   A. Position of department in chart of organization.
   B. Personnel of department: qualifications, training, desirable personality traits.
   C. Relations with other departments.

II. Specifications.
   A. Drugs, chemicals, and finished products: USP, NF, ACS, company-designated.
   B. Equipment.
      1. Manufacturing and packaging.
      2. Resistance of apparatus to various drugs and chemicals.

III. Inspection: drugs, chemicals, and finished products.
   A. Qualifications, responsibility, and authority of sampler or inspector.
   B. Sampling.
      1. Statistical.
      2. Other methods.
   C. Sampling devices: types, nature, and composition.
   D. Size of samples: individual and composite.
   E. Retention of samples.
   F. Physical inspection by sampler or inspector.
   G. Laboratory examination against specifications.
      1. Physical examination.
      2. Chemical examination.
      3. Bacteriological examination.
      4. Biological examination.
   H. Certification by government agency.
      1. Antibiotics: Food and Drug Administration.
      2. Arsenicals and insulin: National Institute of Health.
   I. Record systems.
      1. Pass or approval slips.
      2. Rejection slips.
      3. Types of control numbers.
      4. Integrated record systems that facilitate tracing of all goods which contain any portion of a specific batch of a drug or chemical.

IV. Working formulas.
   A. Conversion to sizes other than standard quantity described in master formula book or record.
   B. Methods of reproducing standard working formulas or master formula: by hand, printing, photocopying, etc.

V. Control in manufacturing processing.
   A. Checking weights and volumes of all ingredients.
   B. Identifying kettles, tanks, tablet machines, dryers, mills, etc.
   C. Checking weights or volumes of intermediate and finished preparations: weights of granules, tablets, capsules, suppositories, etc., and volumes, specific quantities, temperatures, etc., of liquid or semisolid preparations.
   D. Methods of checking sterilization procedures.
   E. Periodic inspection and examination of scales, balances, graduates, and other measuring devices.

VI. Inspection of finished products for packaging.
   A. Sampling: statistical and other methods.
   B. Examination by laboratory.
   C. Release by laboratory: methods.

VII. Packaging.
   A. Containers and closures.
      1. Specifications.
      2. Sampling.
   B. Filling container.
      1. Use of correct container.
      2. Inspection of products or preparation before filling into container.
      3. Delivery of a definite weight or volume into container.
   C. Labeling and cartoning.
      1. Specifications: paper, grain, glue or adhesive, ink.
      2. Use of correct label and carton.
      3. Strict accounting of number of labels and cartons.
      4. Legal requirements of labels.
         a. Food and Drug Administration.
         b. State and municipality requirements.
         c. Foreign countries.
         d. Professional associations.
            (1) Council on Pharmacy and Chemistry of AMA.
            (2) Council on Dental Therapeutics of ADA.

VIII. Accounting department checks on materials: before processing, before packaging, and after packaging.

IX. Record systems in shipping and sales departments: to facilitate tracing and recalling packaged goods shipped from plant or warehouse.

X. Inspection and sampling of finished goods in warehouse or stockroom at regular intervals: for evidences of deterioration or decomposition.

XI. Returned goods.
   A. Reasons
   B. Re-inspection and disposition.

XII. Sanitary standards.
   A. Building requirements.
   B. Housekeeping.

XIII. Federal Food, Drug, and Cosmetic Act.
- A. Packaging requirements.
- B. Label and labeling requirements.
  1. Nomenclature.
  2. Type size.
  3. Declaration of active ingredients.
  4. Quantitative declarations.
  5. Directions.
  6. Warnings.
  7. Control numbers.
- C. New drug application.
  1. Necessity for.
  2. Information required to prepare.

XIV. Federal Caustic Poison Act.

XV. Federal Insecticide, Fungicide, and Rodenticide Act.

The three-hour laboratory period should be devoted to putting into practice as much of the above theory as is possible. Certainly some work should be accomplished in sampling; physical, chemical, bacteriological, and biological examination of incoming drugs, chemicals, and finished products; keeping of records and master formulas; packaging and labeling. Various types of sampling devices should be available for inspection and use. Some problems in statistical analysis and control should be solved.

A course as outlined here would, I believe, thoroughly educate the student in the fundamentals of the control systems and procedures necessary for large-scale production of pharmaceutical products, and be of unquestionable value in broadening his perspective in the practice of his profession.

The re-planning of professional curriculums should have as its ultimate objective a total program of education directed toward professional competence, personal development, and intelligent citizenship.

Glenn L. Jenkins, Am. J. Pharm. Ed., 9, 415 (1945)

THE PHARMACIST IN INDUSTRY

P. W. WILCOX

The position of the pharmacist in industry has been discussed "ad libitum" with increasing vigor ever since the first day of the trend toward the use of manufactured rather than compounded medicinals. Such a metamorphosis is not unique in this country. Our grandfathers made new wheels for the wagon when one was damaged. Our first pair of knickers was made by our mother from a pair of father's long pants, care being taken to avoid the translucent posterior areas. Now the farmer buys a wheel from Sears Roebuck, and our suits are selected from a tremendous variety, many of which are prefabricated by artisans specializing in quantity production. This, to my mind, is a sane and sensible trend.

In the profession of pharmacy a similar progression has taken place and will continue. Manufacturers are preparing medicinal agents in large quantities using modern methods of production, control, and distribution. As a consequence, the industry needs professional scientific pharmacists who are trained to think in these terms.

Obviously, but few individual men have the capacity to organize so highly their thinking that they can be successful specialists in all phases of any industry. The physician receives training in the basic sciences related to general medicine and then progresses toward his chosen field of specialization, i.e., pediatrics, surgery, geriatrics, etc. The lawyer takes a similar course and finally obtains competency in corporation law, patent law, criminal law, etc. It will not be shocking, therefore, to the graduate in pharmacy to learn that if he wishes to reach the top of his profession, he must follow a similar course of preparation.

The major divisions of interest in industrial pharmacy have been described many times. They include research, development, production, control, sales, distribution, economics, engineering, etc. It is well to understand thoroughly the boundaries of these elements and to have a general appreciation of the functions of each, but this information does not qualify one for a starting position. The faculties of some of the colleges now recognize these facts and in the past several years have reorganized drastically to accommodate these trends. Some time may elapse, however, before the average student approaches industry with such refined objectivity. At present, the average undergraduate student asks for an industrial interview with the thought foremost in his mind that if and when he graduates he will do anything asked of him to the best of his ability. This, in itself, is laudable but not enough. When asked what degree of specialization he has accomplished, his reply is often to the effect that he is not interested in teaching, hospital pharmacy, or a government position. It has taken many centuries to arrive at the position where we now find ourselves. Perhaps we cannot expect this degree of clarification overnight.

An industrial pharmaceutical research laboratory is often divided into the fundamental and developmental phases. The personnel in each is further classified by specific interests or abilities. This classification may well be along the following lines:

1. Tablets, Granules, and Powders
2. Capsules (Dry-filled and Soft-elastic)
3. Sterile Pharmaceuticals
4. Oral and Topical Liquids
5. Ointments, Jellies, and Lotions
6. Analytical
7. Packaging, etc.

The research director must maintain a staff in each of the fields selected and, below the unit head, train for replacement so that at all times there may be an intensive application to the specific pharmaceutical problem at hand. This is poorly done when laboratory personnel have to review first the fundamentals before they tackle the immediate problem. Industrial research looks to the colleges to provide this specialization in graduate studies.

For many years, I and others in industry have been concerned with the need for reemphasizing in the schools of pharmacy the science of pharmacy, defined as *the science and art of preparing, preserving, compounding, and dispensing medicines.* Pharmacy, as just defined, is one of the oldest arts known to man, and, as a profession, it has a great heritage. Not only has pharmacy made great contributions to man's battles against diseases, it has begotten eminent scientists in related fields, and in some respects pharmacy may be considered as the mother of related fields of science. The contributions of Scheele, Pelletier, Liebig, and many others attest the influence of pharmacy on the development of chemistry. Other scientific fields, such as pharmacology, botany, and bacteriology also have been influenced by the men of pharmacy.

Although these allied sciences were nurtured by pharmacy, they have separated and grown enormously in size and scope. Each field of science is now a major segment of the modern university, no longer dominated by the teachers of the schools of pharmacy. Collectively, these fields of science have brought forth countless new advancements resulting in our present way of living. In recognizing these scientific developments, we may ask ourselves these searching questions:

1. Has pharmacy as a science kept pace with other fields of science?
2. Have the colleges of pharmacy sufficiently stressed the development of the science of pharmacy?
3. Have the colleges of pharmacy recognized the full impact of the changes in the practice of pharmacy and adequately reorientated their curriculum and methods of teaching?
4. Have the colleges of pharmacy exerted a continual leadership in pharmacy research or have they defaulted to industry?

My own observations lead me to believe that the colleges of pharmacy have been slow to realize and implement their responsibilities and objectives in our changing world. If one examines the publications of the *Scientific Edition, Journal of the American Pharmaceutical Association* for the first six months of 1955, one finds only sixteen papers out of a total of 116 devoted to pharmacy. Although it is true that contributions by allied disciplines, such as chemistry, pharmacology, and bacteriology, are essential in the over-all development of pharmacy, there still remains the fact that the efforts in these allied fields, as recorded in our pharmaceutical journals, overshadow those of pharmacy itself.

Notwithstanding the deficiencies, we recognize that the colleges of pharmacy have been asking themselves these same questions during the past ten years and some colleges have indeed made some significant changes in their curricula. The five year plan is a bold and imaginative reply to meet the challenge facing our colleges of pharmacy.

The flexibility and depth of the five year plan declare that the sole, primary purpose of the colleges of pharmacy is no longer the training of students for state board examinations and retail pharmacy. The plan presents a broader basic approach to the fundamentals of pharmacy with opportunity to concentrate in one of several fields for careers in the profession of pharmacy. For the first two years, all students, irrespective of their postgraduate plans, must pass all courses listed in the academic, basic science, and professional sections of the curriculum. At this point, the student should make a decision and choose a major to prepare himself for his career. How many will select courses to train themselves for retail pharmacy, medical detailing, hospital pharmacy, pharmaceutical research, production, or control is difficult to predict. The selections made by students will, to a large measure, reflect their own motivations and the strength and leadership of the teachers in the colleges of pharmacy.

The basic and professional scientific courses in the five year plan required of all students, if well-chosen, will form a solid foundation for those entering pharmaceutical research, production, and control. A basic knowledge in analytical chemistry, organic chemistry, biochemistry, biology, physics, physiology, and microbiology are all essential to the pharmacist in industry. Without these basic sciences, the pharmacist cannot carry his share and cannot collaborate with scientifically trained people of other disciplines in the development of a new drug. The chemist who discovers a new drug is not capable of developing it into forms which the physicians may use. In my own experience I have seen this happen too often! The brilliant synthetic chemist usually does not have the remotest idea of how to go about producing formulations and is often amazed at what the pharmacist can do. This is what I expect. Compounding of drugs is the responsibility of the pharmacist, but in accomplishing the objective, the pharmacist must have an understanding of the chemistry of the drug. The knowledge of the chemistry and biochemistry of penicillin has made it possible to improve its therapeutic applications. Today, we have solutions, suspensions, and oral forms of penicillin, and with the development of these forms, the scope of penicillin therapy has increased markedly.

The courses available beyond the second year are also well conceived for careers in research, production, and control. Physical chemistry is essential for the practice of modern pharmacy, and very few modern formulations can be developed without an application of the principles of physical chemistry. A knowledge of physical chemistry is needed to understand thixotropy, surfactants, suspending agents, and their applications. The intravenous therapy of fat soluble compounds would find important use today in medicine if we knew how to prepare safe intravenous emulsions. How small must a particle be in an emulsion for safe intravenous administration? How can one prepare a stable, sterile, injectable emulsion, free from pyrogens with controlled particle size below one micron in diameter? These problems can only be solved through a knowledge of the principles of physical chemistry. And I want to emphasize that these problems are not solved by physical chemists but by pharmacists with a real understanding and knowledge of physical chemistry.

Advanced pharmacology is also a prerequisite for a pharmacist in industry. A pharmacist in the development of a drug must have an understanding of pharmacology to work with the pharmacologist studying a new drug in animals or in patients. To develop the most efficient formulation, a research pharmacist must determine the effect of vehicles on the activity of a drug and the effect of particle size on absorption. He must know something about the nature of the drug's toxicity and use this knowledge in his developmental studies. He must gain a better understanding of the absorption of drugs through the intestines, skin, mucous membrances, and the lungs and what part the vehicle plays in absorption. We know too little about the relation between ointment bases and the effectiveness of drugs in these vehicles. Some of our important drugs have failed in the treatment of a skin disorder because of inadequate knowledge about skin absorption. Recently we have had a striking illustration of the relationship of pharmacy and pharmacology with our new antibiotic *Cathomycin*. When this crystalline antibiotic in its acid form is administered orally, practically no absorption occurs as indicated by blood levels. If this material is micronized or precipitated in a finely divided, amorphous form, it becomes an orally effective and life-saving drug.

The program for pharmaceutical research should offer a good foundation for entering pharmaceutical research in industry and for graduate work in pharmacy as a science. Most of the advances in the practice of pharmacy during the past twenty years have been made in industry rather than in the schools of pharmacy. A large number of the new techniques, essential to the practice of present-day pharmacy, have not been published in our journals or in our textbooks. I hope that in the future this responsibility will come back to the schools of pharmacy.

The courses in the colleges offered for careers in pharmaceutical production, such as sterile products manufacturing, industrial pharmaceutical manufacturing, and pharmaceutical control methods, must be well conceived and functional. The production of formulations on a large scale is the foundation of industrial pharmacy and is an integral part of our medical economy. When penicillin was first reported by Florey and Chain to be effective in the control of certain infectious diseases, the need for a practical formulation producible on a large scale became evident. The instability of penicillin in aqueous solutions and to dry heat made the production of large quantities of the formulations a very difficult production task. This was a new problem in pharmaceutical production, and we who lived through those hectic days had little to draw on from the practices of pharmacy. Without the new techniques developed then, many would have been deprived of this life-saving drug.

Pharmaceutical production needs some touches of chemical engineering principles, and it is hoped that colleges of pharmacy will draw on the faculty of the engineering schools in designing the course of industrial pharmaceutical engineering.

The control of the quality of medicines is one of the greatest responsibilities of the pharmaceutical industry. Above all, we must assure safety and efficacy and under no conditions must the quality and the safety of our drugs be compromised. Our standards of quality must be the best, the most rigid, and the most scientific that man can devise.

The past fifteen years have provided us with better tools of analyses, some chemical but many more instrumental. These instrumental advances have come from the laboratories of physicists and physical chemists and are now part of

every modern laboratory devoted to the quality control of drugs. An understanding of potentiometric titrations, ultraviolet, infrared analysis, vapor phase chromatography, and even nuclear magnetic resonance is essential for the pharmacist who seeks a career in control. Colleges must take cognizance of the changes in pharmaceutical control and meet the needs adequately.

The five year plan recognizes clearly the need for general education and provides courses to implant into the student the seeds for the development of an educated man or woman. The pharmacist, irrespective of the career he chooses, must be an educated professional who can take his or her place on an equal footing with men and women in the related professions. The need to write reports, to express oneself forcibly—orally and in writing, and to have knowledge and interest in the arts and humanities is greater today because of the increasing complexity of our present civilization. Human values will perish if we become a nation of specialized technicians. Let us recognize, however, that the colleges of pharmacy cannot under the present system produce an educated man as defined by the liberal arts colleges. They can, however, plant the seeds for stimulating the student to continually develop his finer senses and the qualities of the educated man.

In our thinking of the place of industrial pharmacy in the health team, it should be noted that 60 per cent of our drug sales today are of products which did not exist ten years ago and that 90 per cent of the prescriptions written by doctors today could not have been filled twenty years ago. Without doubt the day will come when posterity will consider drugs used today as bizarre as we consider some of the remedies used by Paracelsus in the 16th Century, such as oils distilled from the skull of a man for the treatment of epilepsy. Regardless of what the future holds, it is up to us, the present guardians of the sciences, to give pharmacy the support it needs. The colleges must give us confidence that the challenges of the future will be met.

If we examine our fitness for the role of leadership we shall probably discover that our greatest shortcoming lies in the fact that we have been willing to sacrifice our idealism, that we have been willing to accept mediocrity in too many cases, because we found it easier to feel that mediocrity was good enough.

R. A. Kuever, Am. J. Pharm. Ed., 6, 439 (1942)

ARTICLES

THE INVESTIGATIVE APPROACH IN TEACHING DISPENSING *

GLEN J. SPERANDIO

Although pharmacy has changed radically in the past twenty years, the prescription department is still the foundation of the American drugstore, and the courses in dispensing represent to most students that area in which they are chiefly interested, or at least the area most closely connected to their experiences in retail work, or their conceptions of retail work. This fact alone makes the teaching of dispensing pharmacy a particularly important assignment.

In teaching any course involving practical application of technical knowledge, the teacher must at the very beginning establish three things: (1) exactly what he expects his students to accomplish in the course, (2) how much time he has to administer the course, and (3) what preliminary training or background the students have for the course.

The different schools of pharmacy vary to some extent in the sequence and content of courses, but in order to properly understand dispensing, a student should have had at least the following courses: inorganic and organic chemistry, botany or zoology and general pharmacognosy, and general pharmacy. Of course the level at which the dispensing course is taught will be determined by the preparatory courses the students have had.

How should the course in dispensing be taught? In seventy different schools of pharmacy there will probably be seventy different ideas. I have tried a number of different approaches and have finally adopted what might be called an "investigative" approach to learning. You notice that I say it is an approach to learning, and here I draw a fine distinction. One can *teach* students or one can *help them to learn.* When a student is taught something he more or less accepts facts and statements and memorizes them as something he must know, and often the true meaning of a course is not realized. When a student is helped to learn something he unconsciously acquires knowledge by personally injecting himself into a problem and understanding the nature and solution of it. So the investigative approach is really based on personal experimentation along guided lines.

To be effective, a course must be well planned with definite objectives; and there should be objectives for the teacher as well as for the students. In the first meeting of my classes, the objectives of the course are outlined to the students so they know what to strive for and what will be expected of them. The objectives set up for the students are:

(a) To obtain an understanding of the prescription and the pharmacists' responsibilities concerning it.

(b) To learn the techniques of compounding and to develop manual dexterity and professional skill.

(c) To become familiar with the drugs and chemicals commonly used in prescriptions, and to acquire a working knowledge of their physical and chemical properties.

* Presented to the Section of Teachers of Pharmacy, AACP, Miami Beach, Florida, 1955.

(d) To develop a feeling of professional pride and confidence.

At the same time, the assistants in the course are shown the following objectives that the teacher should have:

(a) To help the students correlate academic instruction with what they see and hear in the retail pharmacy and properly to evaluate it.
(b) To make the lecture presentations interesting, up to date, and practical.
(c) To encourage each student to *think* about what he is doing and to apply material learned in other courses to dispensing problems.
(d) To instill in each student a degree of self-confidence and a pride in his profession.
(e) To help sincere students and avoid failing them if possible.

This last objective deserves additional comment: Frequently students who are not doing satisfactory work get discouraged and adopt a defeatist attitude. Many of these students can be helped if an instructor shows a personal interest in them and works with them for a week or two to show them how they can do a better job. Of course an occasional student is just completely unsatisfactory, and if he does not meet the minimum requirements for the course he repeats it until he does.

In administering a course in dispensing, a clear-cut policy of rating and grading students must be established and rigidly followed. Our beginning course in dispensing is a four-credit course with two one-hour lecture periods and two three-hour laboratory periods per week. The lecture and laboratory parts of the course are given equal weight in determining the final grade. However, to obtain credit for the course, a student must attain the minimum passing average in each section. Thus if he fails one part of the course, no matter what his grade is in the other, he is required to repeat the entire course. Regularly scheduled hour exams are given in the lecture part, and in addition the students are warned to expect daily quizzes at any time. This encourages steady attendance since there are no make-ups on missed quizzes. These standards are clearly defined, but of course they only indicate the mechanics used to evaluate student attainment and progress. The method of laboratory teaching is the most important factor in helping students learn and remember what they learn.

Our approach to teaching is based on the thesis that if a student can only understand *why* he does things, and if he can logically explain the mechanics of compounding, the learning process is greatly facilitated. We tell our students that there must be a valid reason for every principle of dispensing that they learn, and we encourage them to ask the question: "why?" This is a very important question in both lecture and laboratory sessions, and the students are told to feel free to interrupt at any time with questions. The lectures are arranged to correlate with the laboratory work, so that when the students have a laboratory assignment they have already discussed it in lecture, and no time is needed to be taken from the laboratory period to orient them.

The laboratory is set up on the basis of a sixteen weeks' semester with six hours of work per week. A minimum number of 100 prescriptions to be filled by each student is established, although this goal is frequently not reached. At the beginning of each laboratory period the students are given a sheet containing from eight to ten mimeographed prescriptions. Each student then copies one prescription at a time onto a regular prescription blank in his own handwriting and fills the prescription. Here we try to start the student thinking about the individual prescription—what it is for, the type of ingredients in it, the

dosages, and possible ways to compound it. The prescriptions used are obtained from various drugstores and are changed regularly. Some of the prescriptions contain overdoses of toxic drugs. At the first laboratory period the students are told this and are warned that they must not fill a prescription containing improper dosages; if they do, it is considered that they have killed a patient. We allow a student to "kill" three patients in the course; if he fills three prescriptions with overdoses, he automatically is given a failing grade and must repeat the course. In ten years of teaching dispensing I have not had this happen. When a student does fill a prescription containing an overdose he is required to write a full report of the incident, giving the properties of the drug used, the symptoms and sensations of the patient, details of the death, and possible moral and legal consequences. He must conclude the report with his own reasons for the occurrence of the mistake. We find that this impresses the student considerably, and very few make the same mistake again. We feel that one learns by making mistakes, and we tell the students that it is no crime to make a mistake while learning, but that it *is* a great sin to make the same mistake over and over.

Our students are required to wear clean, white drug jackets in prescription lab. We also encourage personal cleanliness, and, on rare occasions, if a student has a very dirty drug jacket or is careless about his personal appearance, we do not permit him to work in the laboratory and count him absent until he corrects the situation.

We have telephones installed at various locations in the laboratory, and part of the instructional program is devoted to giving the students experience in talking to doctors over the telephone and learning telephone etiquette. The instructors and occasional visitors call in prescriptions which are always "stat" and must be filled before the laboratory period ends. This is a very good way to discourage students from locking up their desks fifteen minutes early and preparing to leave the laboratory ahead of time.

The main purpose of our laboratory instructors is not to grade the students, but to teach them to think about what they are doing and to ***understand*** what they are doing. Laboratory sections are arranged so that one instructor has supervision over ten students, and thus we have close personal contact. The instructors circulate among the students and constantly ask them "why" or reasons for doing things so that the exercises are not just mechanically completed. For example, I recently checked a prescription in which the student had used methyl cellulose 400 cps. as a suspending agent. I asked her what 400 cps. meant and why she used it instead of 100 cps. or 1000 cps. She knew the word centipoise and that it was some indication of viscosity but nothing more. This student was then asked to find out what centipoise was and how it indicated viscosity and what value different viscosity methyl celluloses have. It required perhaps thirty minutes' extra work for the student, but she obtained a good understanding of this aspect of suspending agents.

All prescriptions are checked in front of the students as soon as they are completed. In this manner, any errors are pointed out at the time of commitment. The students can see where they made their mistake, and they can be asked to consider why the error was made. This we find to be particularly effective, because if a student admits that he was careless or in a hurry, or didn't think, the lesson is automatically taught, and recurrences are few. The

next question then asked is what could have been done to prevent the error, and here again we are able to emphasize professionalism.

We do not give numerical grades on any prescription. The students are told at the beginning that there is only one way to fill a prescription—the right way. Consequently a completed prescription is either acceptable or not acceptable. A mimeographed sheet of reasons for non-acceptance of prescriptions is given each student, and a framed copy is posted on each working desk so that it is always in front of the worker. Thus, when a prescription is rejected, there is no cause for argument. At the end of the term the grade in laboratory is determined on the basis of four things: the number of prescriptions filled, the per cent of prescriptions rejected, the laboratory exams, and the instructors' evaluations of the students' techniques, ability, and attitude.

A method of teaching used in the laboratory is that of leading the student to a problem and having him figure out how to overcome it by experimenting and comparing different methods of compounding. Thus he actually sees how different techniques produce different products. Each class of prescription is studied as a group, and we start with dry powders, capsules, and chartula so we can at the same time emphasize metrology and the techniques of weighing. The assigned prescriptions are *type* prescriptions in that they illustrate some basic principle of compounding. For example, one of the first prescriptions given our students is as follows:

Rx.	Sodium Bromide	0.30
	Mag. Oxide	0.25
	Phenophthalein	0.03
	M. Chart. No. XII	
	Sig: One in water H.S.	

The student is told to fill this prescription in two different ways, first by adding the magnesium oxide in divided portions to the phenolphthalein and then adding the sodium bromide which has been previously powdered; and a second time by putting all of the ingredients in a mortar and mixing them. On comparing the two products, visual inspection substantiates three basic rules of mixing powders: that of using geometric progression for mixing small amounts of powders with large amounts, that of adding heavy powders to light powders, and that of powdering granular material before mixing it with other powders. We find exercises such as this to be much more effective than simply giving the rules in lecture or pre-lab recitation and having them memorized mechanically. Also, by having prescriptions filled in other ways we can compare final products and show visually that the suggested method produces the best results.

In any prescription that can be filled in different manners or with excipients that impart different properties to the finished product, we encourage the student to fill it several different ways provided he has a logical reason for so doing. For example, in a prescription for a suspension in which the suspending agent is not specified, a student would perhaps fill that one prescription as many as four or five different times using various suspending agents and comparing the products with respect to ease of compounding, appearance, stability, and cost. This type of experimentation makes the work interesting for the student and often arouses his curiosity so that he learns not only techniques of compounding but also he sees the range of possibilities that exist for him to control the characteristics of prescriptions he compounds. All prescriptions filled, however, must be acceptable for consumer use and are checked on that basis by the instructors.

Thus a student works just as carefully on an experimental prescription and is held just as responsible for it as on a regularly prescribed exercise.

The last portion of the course is devoted to a study of incompatibilities, and in this area we especially encourage experimentation. In all cases where an incompatibility can actually be seen, the student is instructed first to fill the prescription as it is written so he can actually see what happens. Then he is asked to fill the prescription again, this time in a manner which prevents the incompatibility. Frequently a student brings to class a prescription that is causing trouble in the store where he works and asks how it should be filled. To this question we always reply: "What do *you* think should be done?" Then we work with him and lead him to the suggestion of a possible solution. In many instances the students find better solutions for their problems than do the instructors.

In the laboratory the instructors try to remain in the background and allow the students to work out their own problems, because one important objective is to develop self-confidence and competency. The instructors learn to observe without being conspicuous; and then, if we find a student doing poor work or relying too much on his neighbor, we move in and help him get established. We help the students by working with them and showing them instead of just telling them. Of course, to execute properly this plan of teaching, there must be sufficient competent personnel, and usually the assistants are briefed before they go into the laboratory.

It is essential that the professor in charge of a course in dispensing spend considerable time in the laboratory with the students. Too often we are inclined to let the laboratory assistants bear the major part of the work, but this does not make for effective teaching since, more often than not, they too are really learning dispensing for the first time. By actually being in the laboratory and working, the professor imparts greater weight to the course and is better able to see the effectiveness of his teaching program. He is also able to observe his assistants and help them develop into better teachers by setting an example himself.

As I stated earlier, I have tried many different ways of teaching dispensing, and I am still experimenting because I have not yet found the ideal method. However, I feel that the students in pharmacy must be shown how to use intelligently their technical training as a professional tool; and the investigational approach, when properly handled, more nearly accomplishes this purpose than any other method of teaching I have tried.

ADDENDUM

Causes for Non-Acceptance of Prescriptions

1. Improper dosages in prescription
   - (a) overdoses
   - (b) doses improperly calculated
   - (c) doses improperly weighed or measured
   - (d) wrong drug
2. Incorrect directions to patient
   - (a) wrong directions
   - (b) incomplete directions

3. Improper labelling
   - (a) wrong-sized label for container
   - (b) misspelled word or name on label
   - (c) typed-over label
   - (d) soiled or messy label
   - (e) label affixed to container wrongly or crookedly
   - (f) missing necessary accessory labels
   - (g) incomplete labelling on narcotic prescriptions
   - (h) label pasted on top of another
   - (i) loose or improperly applied labels
4. General appearance of prescription
   - (a) Folded powders
     uneven folds—uneven size—improper creases—improper container—powder in folds—leaking papers—soiled papers—uneven weight
   - (b) Capsules
     irregular weight—soiled capsules—improperly filled—wrong size container—fingerprints on capsules
   - (c) Pills
     non-uniformity in size and shape—improper weight—poor appearance—stickiness—cracking—lack of pliability
   - (d) Solutions
     undesired solid particles—hazy solutions—wet or messy containers—fingerprints on bottles—leaking caps—improper size container—wrong type of container—improperly filled container
   - (e) Emulsions and suspensions
     cracked emulsions—plus all above mentioned causes under solutions
   - (f) Suppositories
     wrong size—improper shape—uneven sizes—poor general condition—improper container
   - (g) Ointments
     grittiness—non-uniformity—improper consistency—improper packaging
5. General technique used in filling the prescriptions
   - (a) Preparing incorrect amount or insufficient amount for prescription
   - (b) Extremely poor pharmaceutical technique
   - (c) Extremely messy or dirty working areas
   - (d) Any condition considered by the instructor to be extremely improper

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. . . the prestige enjoyed by any given profession in the eyes of other professions and all laymen is exactly what that profession makes it. There are no numerous ways to build recognition; there is only one way, and everybody knows it. That way is to establish and maintain a code of professional ethics, a code of professional ideals strictly and constantly enforced by the profession itself.

R. A. Kuever, Am. J. Pharm. Ed., 6, 440 (1942)

THE SCHOOL OF PHARMACY IN THE SCHOOLS OF THE HEALTH PROFESSIONS BUILDING UNIVERSITY OF PITTSBURGH *

EDWARD C. REIF

On May 11, 1957, Dr. Edward H. Litchfield was inaugurated as the twelfth chancellor of the University of Pittsburgh. The inauguration, the opening of a new era in the University's history, was preceded by the dedication of a new $18,000,000 Schools of the Health Professions Building, a key structure in the University of Pittsburgh Health Center.

In this new building, a new concept of health education is rapidly developing as the traditional isolation of the Schools of Medicine, Pharmacy, Nursing, and Dentistry dissolves. The thirteen-floor structure, occupying 630,000 square feet and seven million cubic feet, is the new home of the University of Pittsburgh School of Pharmacy. Under the guidance of Dr. Robert A. Moore, Vice Chancellor, the School is cooperating in the immediate objective of the Schools of the Health Professions—to initiate a broad educational program designed to raise the level of health of the individual throughout his life span.

The entire community will benefit from the advances in teaching, research, and patient care which will be stimulated and transmitted through the physicians, pharmacists, dentists, and nurses who are receiving their education here. Industry, local philanthropic foundations, and individuals have contributed almost $13,000,000 toward the total cost of the structure, a degree of support to private health education that has not been exceeded elsewhere.

CONSTRUCTION

The building is divided vertically into three segments. The first two floors are for general purposes: storage, shops, lockers, student center, library and deans' offices. The third to the sixth floors are devoted exclusively to teaching. Research laboratories and offices occupy the sixth to the twelfth floors. The thirteenth floor houses the machinery necessary to operate the building.

This arrangement simplifies the problem of vertical transportation. The first six floors, carrying the heaviest traffic, are served by escalators to supplement the electronically controlled elevators which serve all the floors.

The traditional allotment of space in most health schools is by department, each of which has its own facilities for teaching, research, and administration. Since the old system leaves many lecture rooms and laboratories unused much of the time, a new method has been devised for the new building.

By the adoption of the module principle and movable partitions, the teaching and research floors may be converted, as needed, into units of varying sizes.

Applying the module principle to laboratory space, module units have been set at eighteen feet. Half of such a unit, or nine feet, accommodates a small laboratory. Evidence is accumulating that the big laboratory, accommodating an entire class, is less effective for teaching than smaller units. Laboratories ac-

* This article was invited by the Editor.

commodating from thirty to forty and fifteen to twenty students are preferred.

Lecture and seminar rooms, which are shared by all four schools, as are the laboratories, may also be varied in size by folding partitions.

MODERN AUDITORIUM

An outstanding feature of the building which is shared by pharmacy students and the other groups is a large auditorium extending from the third to fifth floors, with a seating capacity of 675. It is easily convertible into two lecture rooms by means of an electrically controlled sliding partition. It is to be noted that the auditorium is available for use by all of the health professions in western Pennsylvania for meetings and institutes, as well as sectional and national professional programs. The auditorium includes space for a television studio with a room antenna, permitting microwave transmission of programs directly to WQED, Pittsburgh's educational channel.

Utilities, such as water, gas, electricity, steam, and air pressure, are fed to each laboratory floor through a central utility riser, branches from which are suspended from the ceilings to supply each modular unit, thus making needed changes easy and inexpensive.

Thus the entire plan of the new building provides unusual flexibility to meet changing educational programs and teaching methods. For instance, while the dean and faculty of each school are responsible for the administration of their schools, they are not housed on the same floor with their respective staffs. Those of like scientific interests have offices and laboratories in the same general area. Thus, pathologists, pharmacologists, bacteriologists from all schools are in constant touch.

Also, for the first time, students of the four professional schools have an adequate and convenient Student Lounge for the normal interchange of "shop talk." Here pharmacy students get together with medical, nursing, and dentistry students at the snack bar, the mail room, or at the bookstore exclusively for the health professions, to discuss their daily experiences and problems.

LIBRARY

The library, located on two floors, is divided into a general and a specific area; e.g., on one floor is a general library containing books for general reading such as current journals (covering the past ten years), and on the other floor is a specialized research area containing material for the four schools together with journals dating back 100 years. The library contains 140,000 volumes with room to expand by another 20,000-30,000 volumes. The two libraries connect by a stairway that is not open to the traffic of the general public. The libraries have 70-foot-candle power and are fully air-conditioned. Since these libraries will serve all the health professions in western Pennsylvania and not just the University of Pittsburgh, an entrance for the convenience of these people using the library is directly off the parking lot.

A fully equipped kitchen now being completed in the new building not only will service the cafeteria which can seat 700 at one time, but also will service bed patients of the adjoining hospitals. Student schedules will be staggered so that not all students will arrive at the cafeteria at the same time.

There is also a suite of rooms devoted to Student Health. This contains examining rooms, treatment rooms, and a reception area.

Across the hallway from the Student Health area, space is provided for 1,400

FIG. 1 AERIAL VIEW OF THE UNIVERSITY OF PITTSBURGH HEALTH CENTER

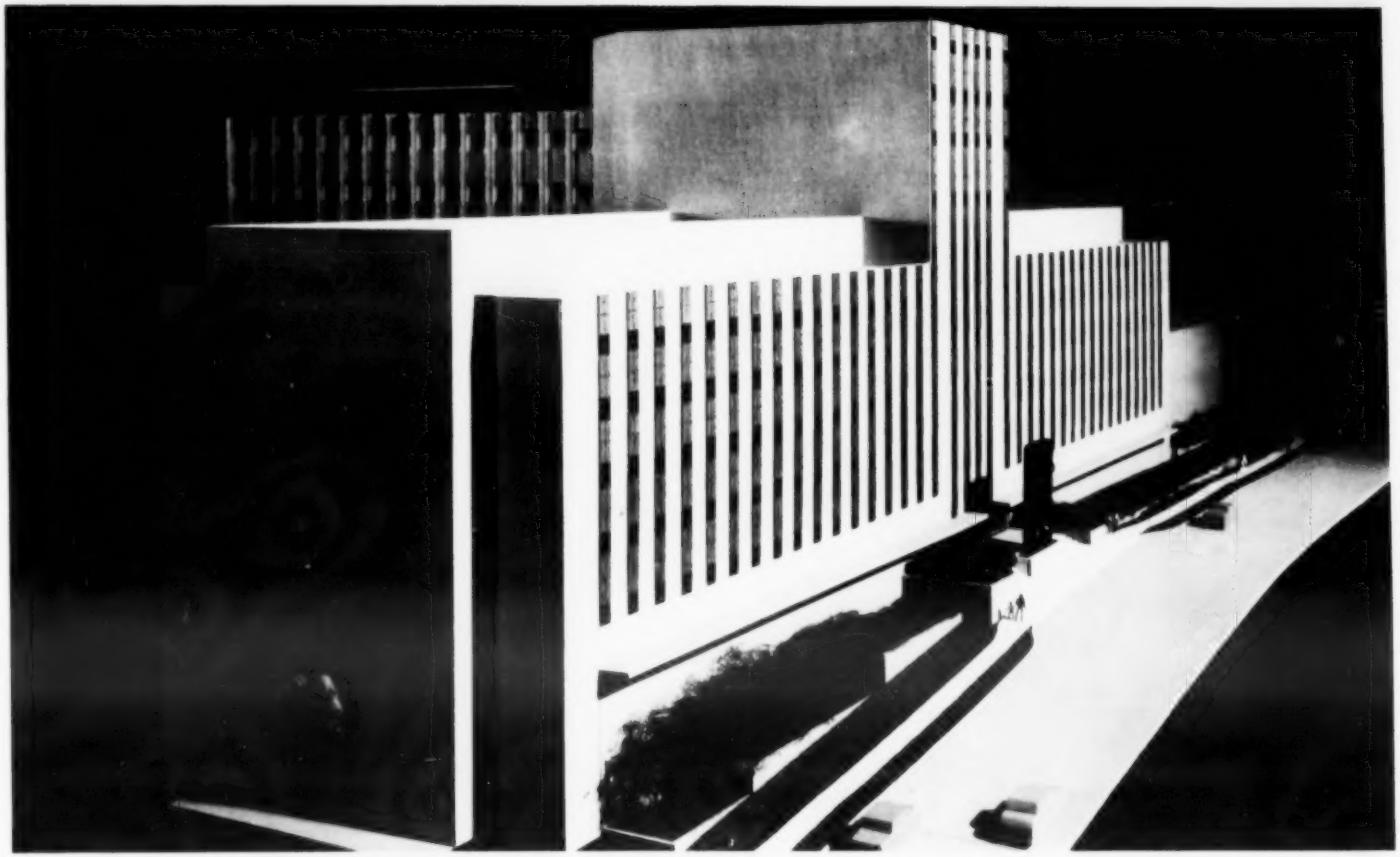

FIG. 2 ARCHITECT'S MODEL OF THE SCHOOLS OF THE HEALTH PROFESSIONS BUILDING, UNIVERSITY OF PITTSBURGH

FIG. 3 LOWER HALF OF AUDITORIUM, UNIVERSITY OF PITTSBURGH

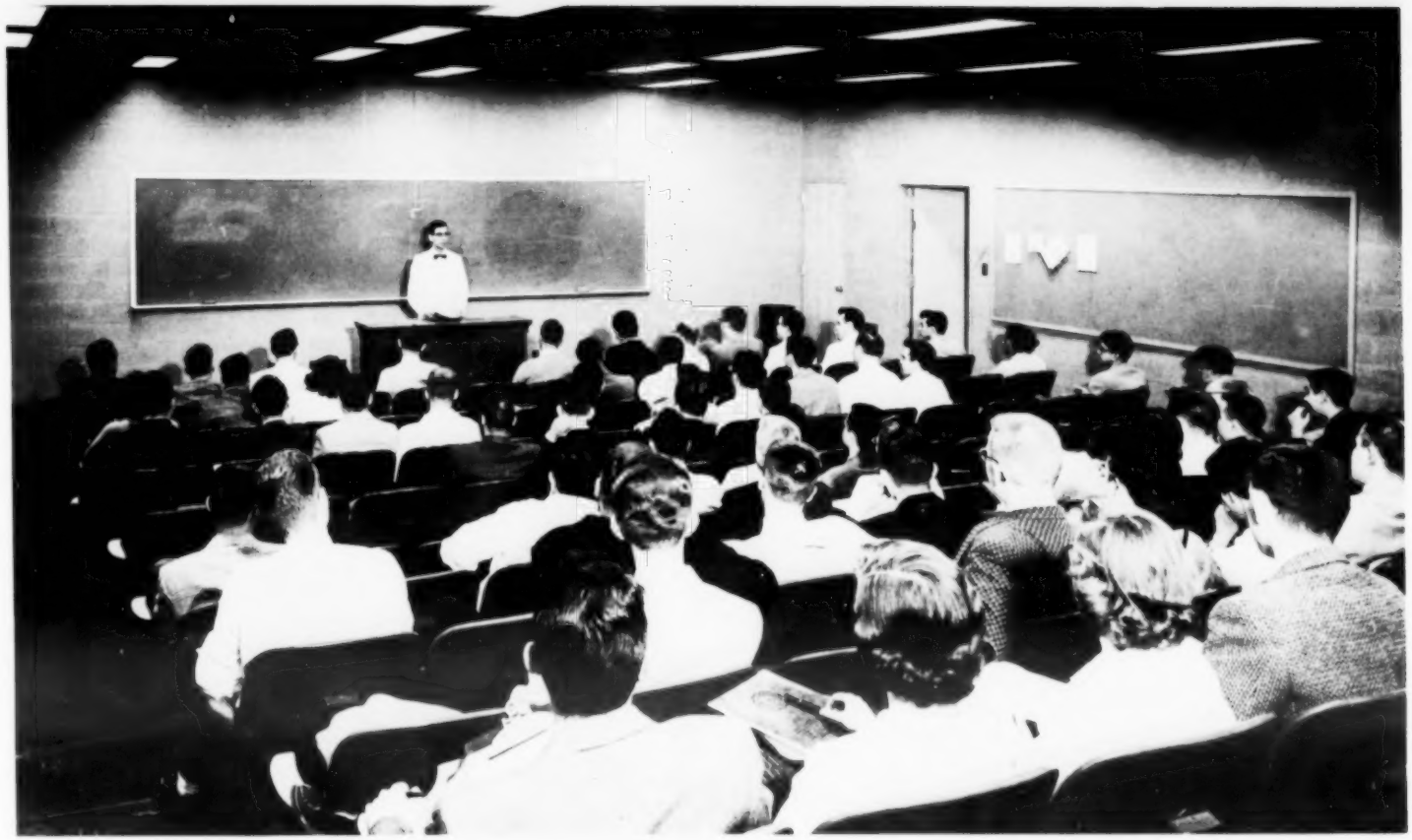

FIG. 4 LECTURE ROOM, UNIVERSITY OF PITTSBURGH

FIG. 5 PHARMACY LABORATORY, UNIVERSITY OF PITTSBURGH

FIG. 6 PHARMACOGNOSY-MICROBIOLOGY-HISTOLOGY LABORATORY, UNIVERSITY OF PITTSBURGH

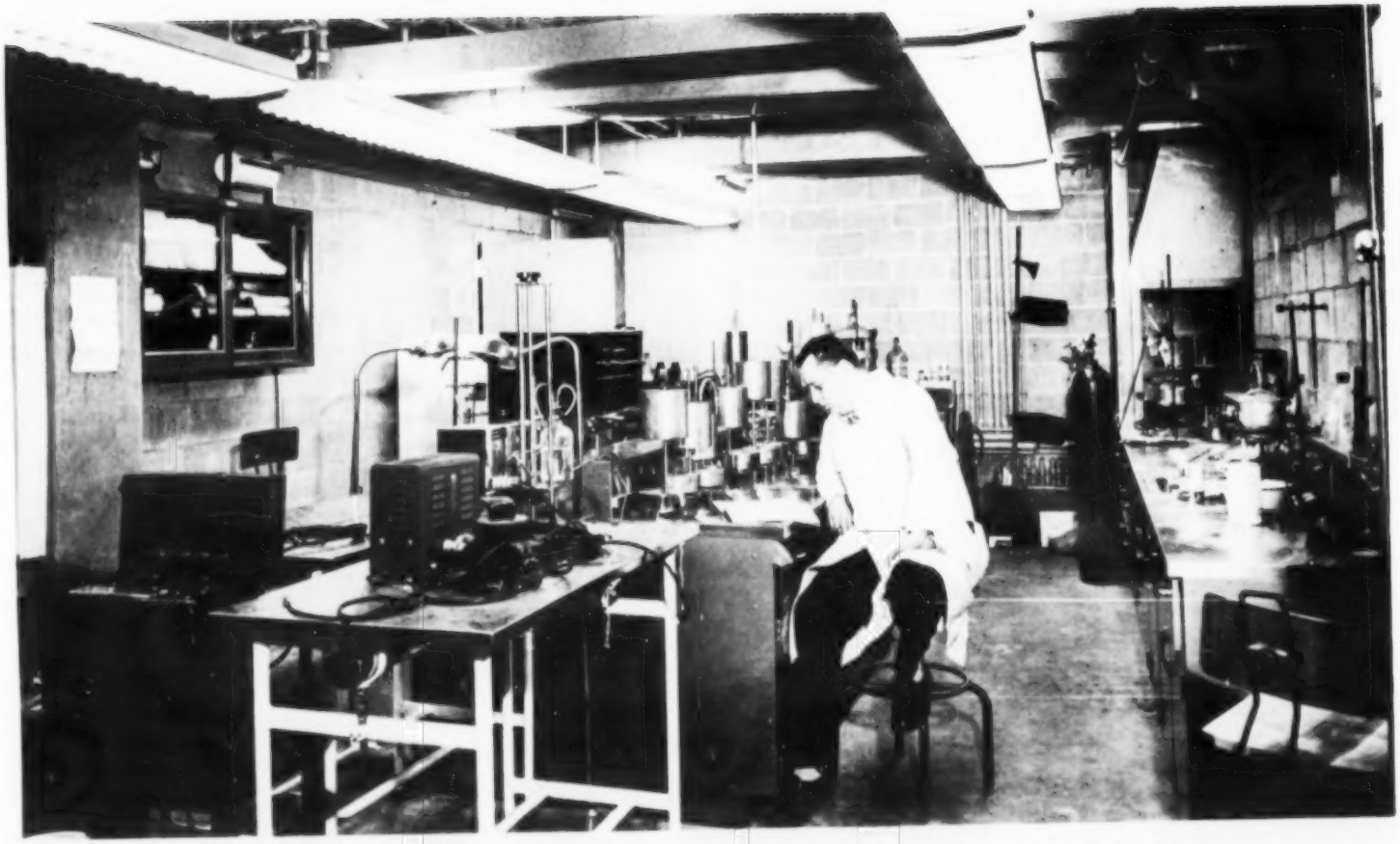

FIG. 7 GRADUATE PHARMACOLOGY LABORATORY, UNIVERSITY OF PITTSBURGH

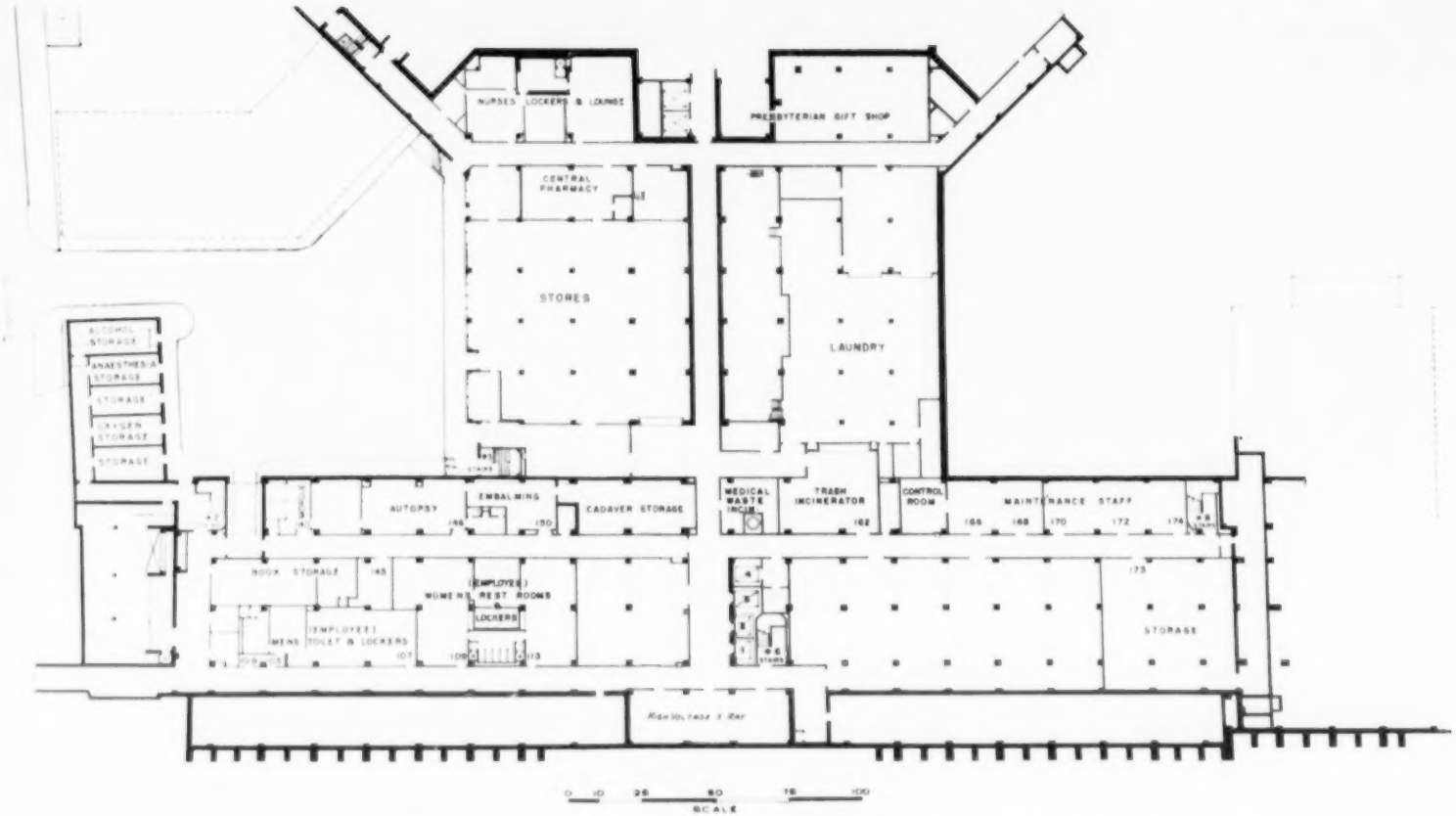

FIG. 8 FIRST FLOOR PLAN, SCHOOLS OF THE HEALTH PROFESSIONS BUILDING, UNIVERSITY OF PITTSBURGH

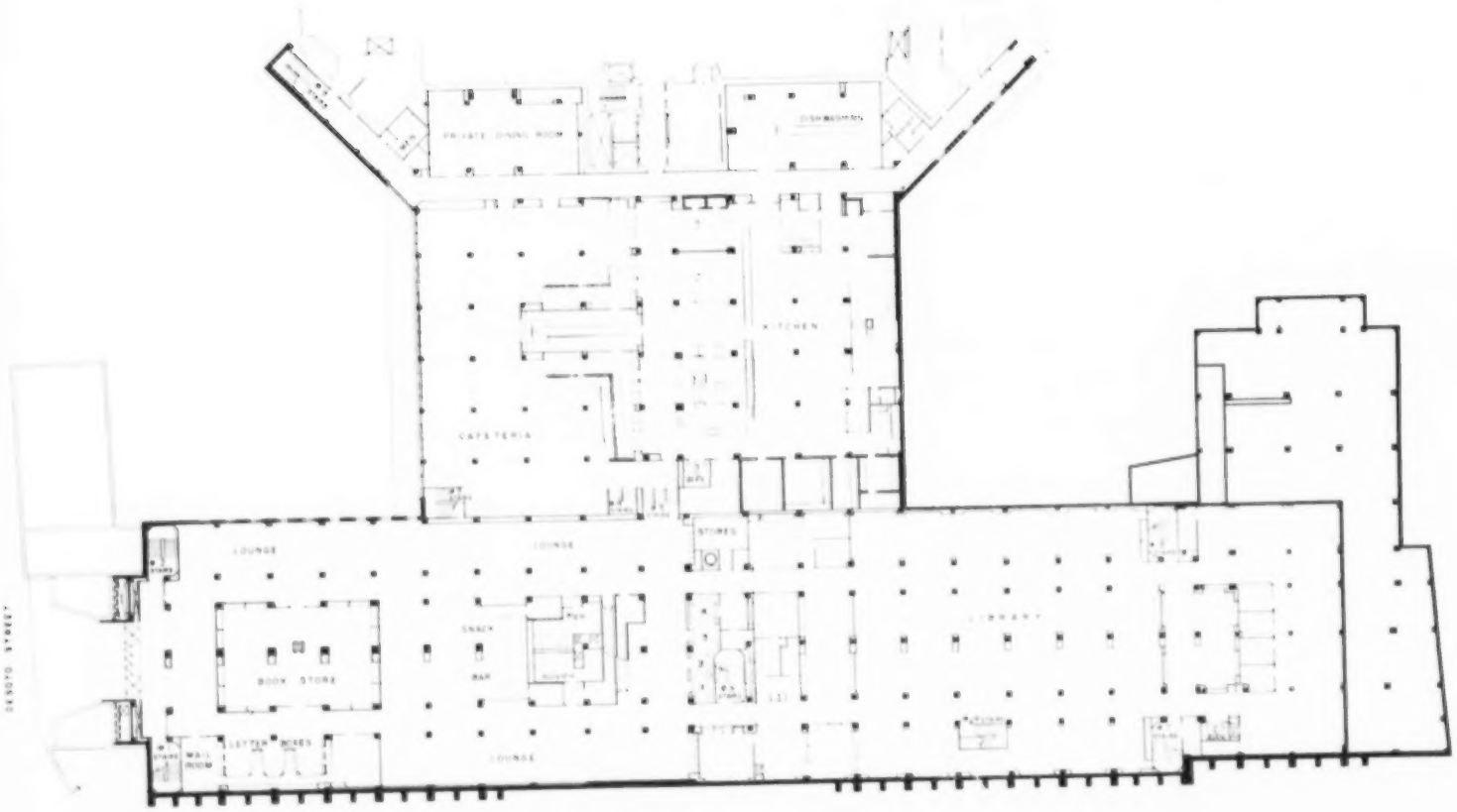

FIG. 9 SECOND FLOOR PLAN, SCHOOLS OF THE HEALTH PROFESSIONS BUILDING, UNIVERSITY OF PITTSBURGH

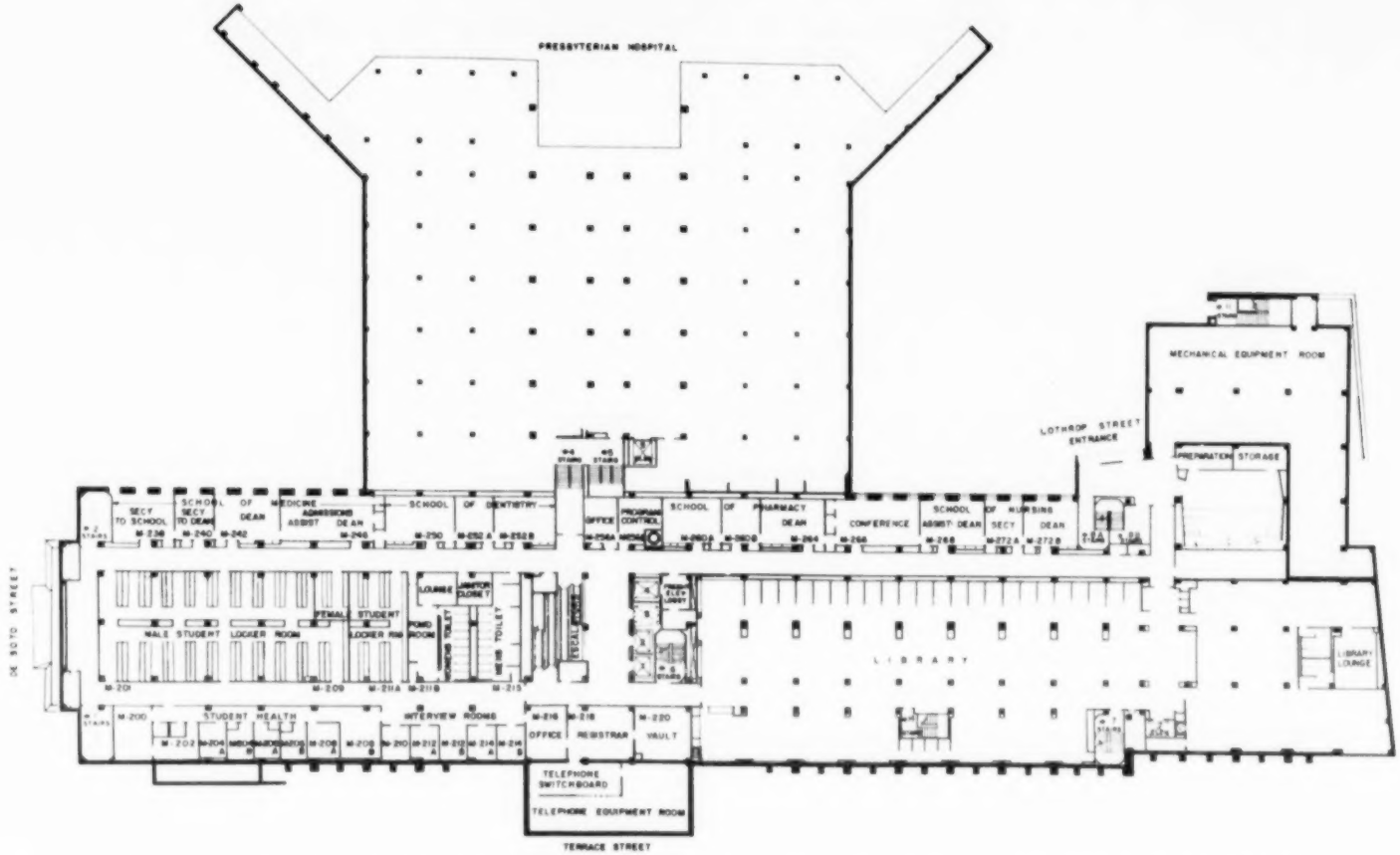

FIG. 10 SECOND FLOOR MEZZANINE PLAN, SCHOOLS OF THE HEALTH PROFESSIONS BUILDING, UNIVERSITY OF PITTSBURGH

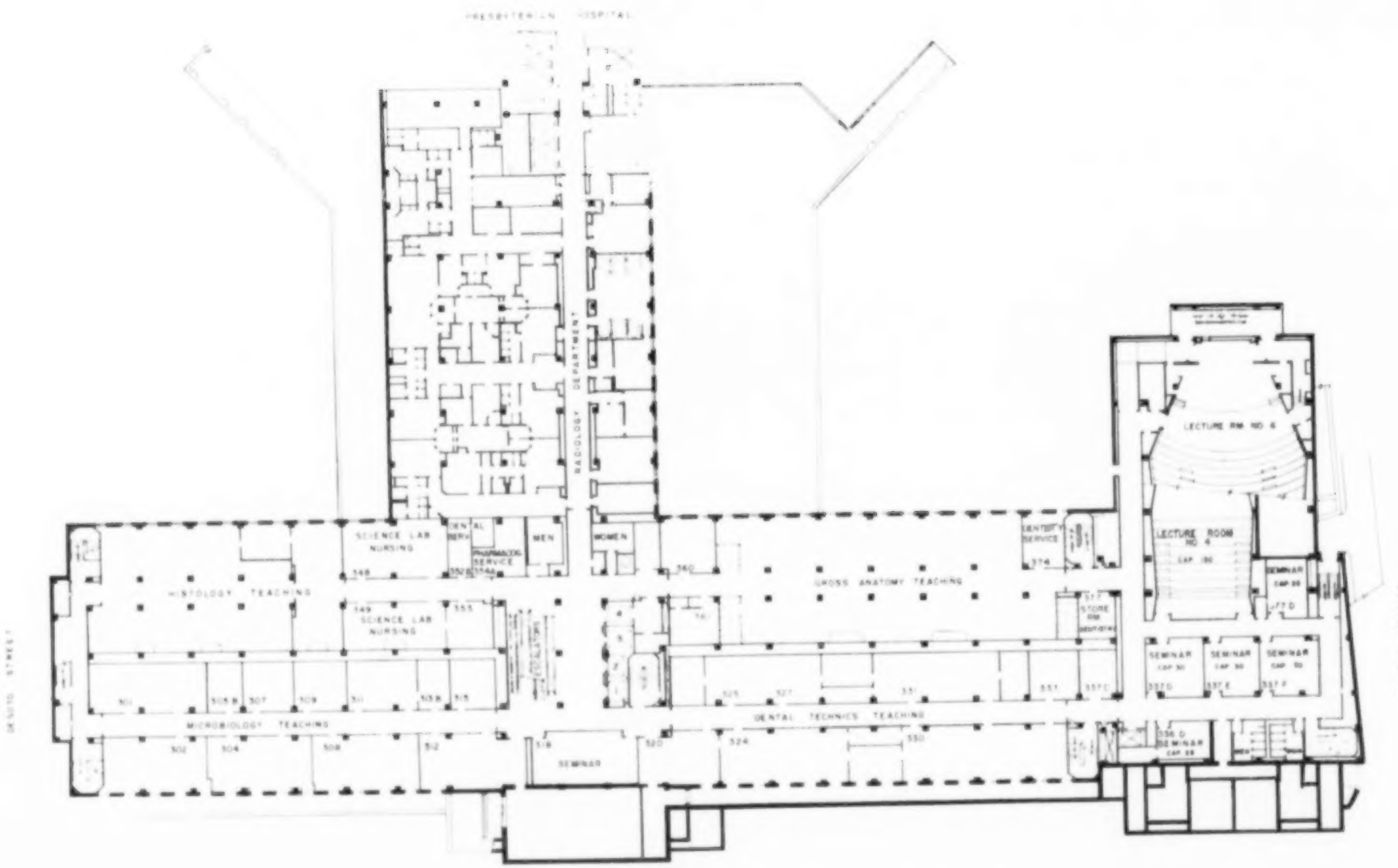

FIG. 11 THIRD FLOOR PLAN, SCHOOLS OF THE HEALTH PROFESSIONS BUILDING, UNIVERSITY OF PITTSBURGH

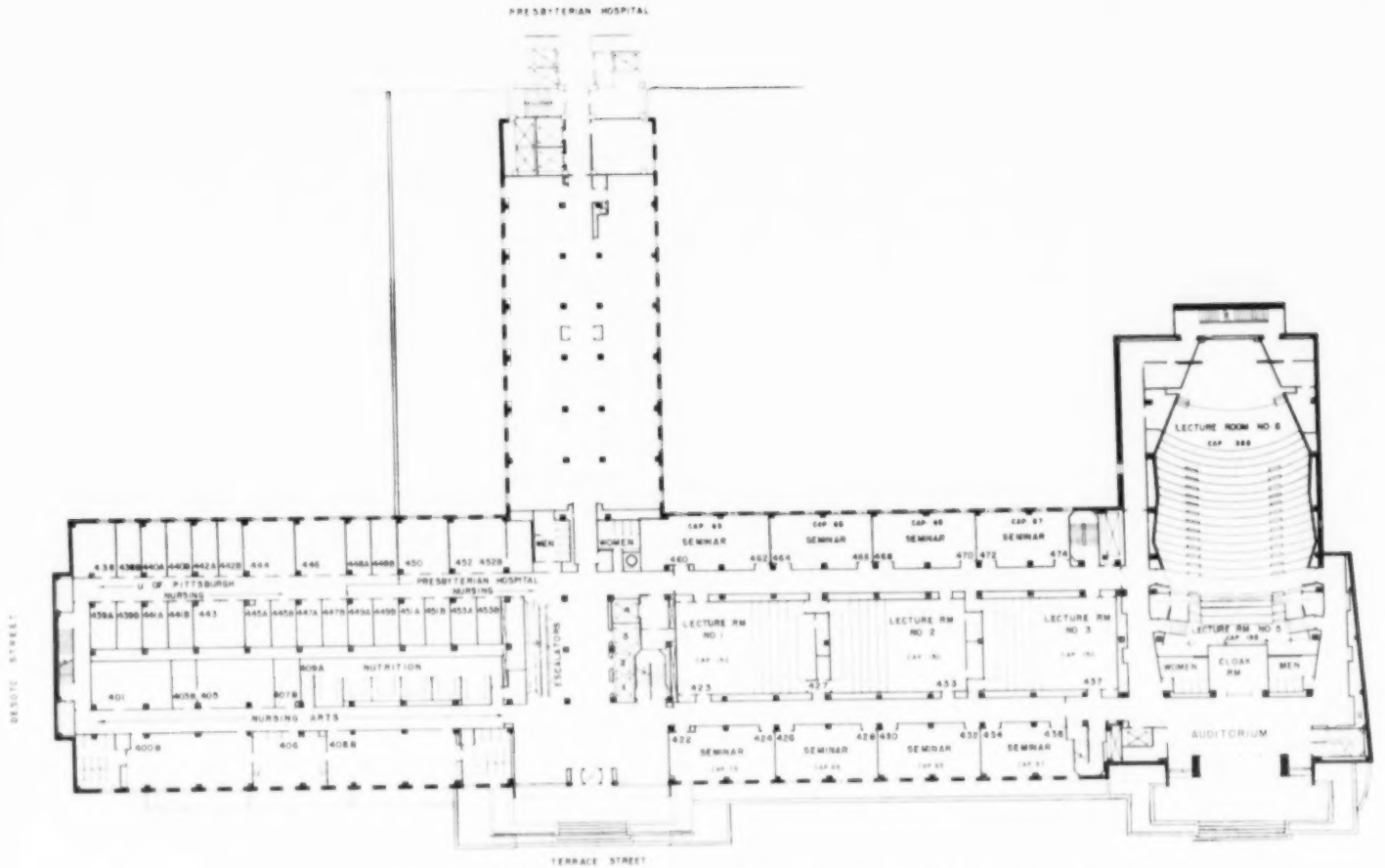

FIG. 12 FOURTH FLOOR PLAN, SCHOOLS OF THE HEALTH PROFESSIONS BUILDING, UNIVERSITY OF PITTSBURGH

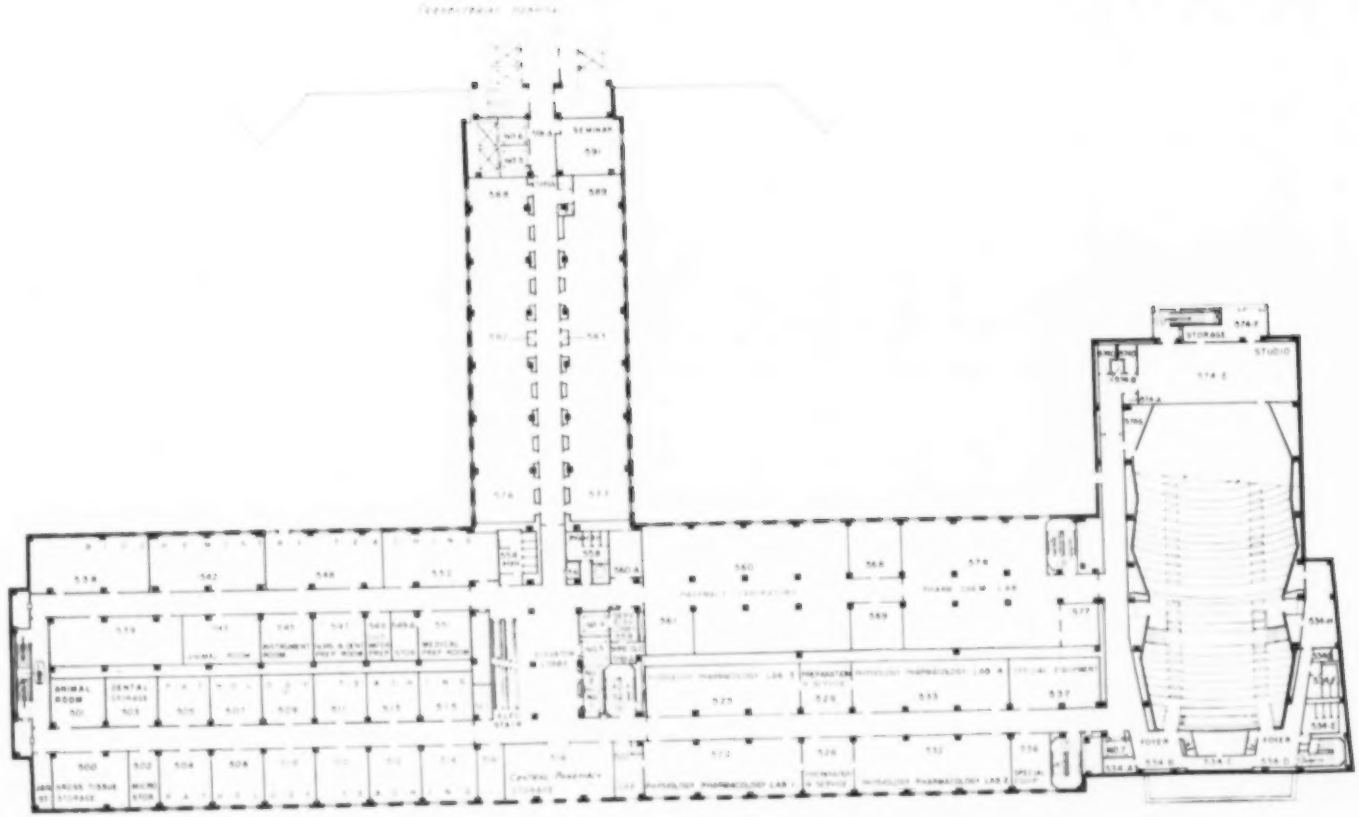

FIG. 13 FIFTH FLOOR PLAN, SCHOOLS OF THE HEALTH PROFESSIONS BUILDING, UNIVERSITY OF PITTSBURGH

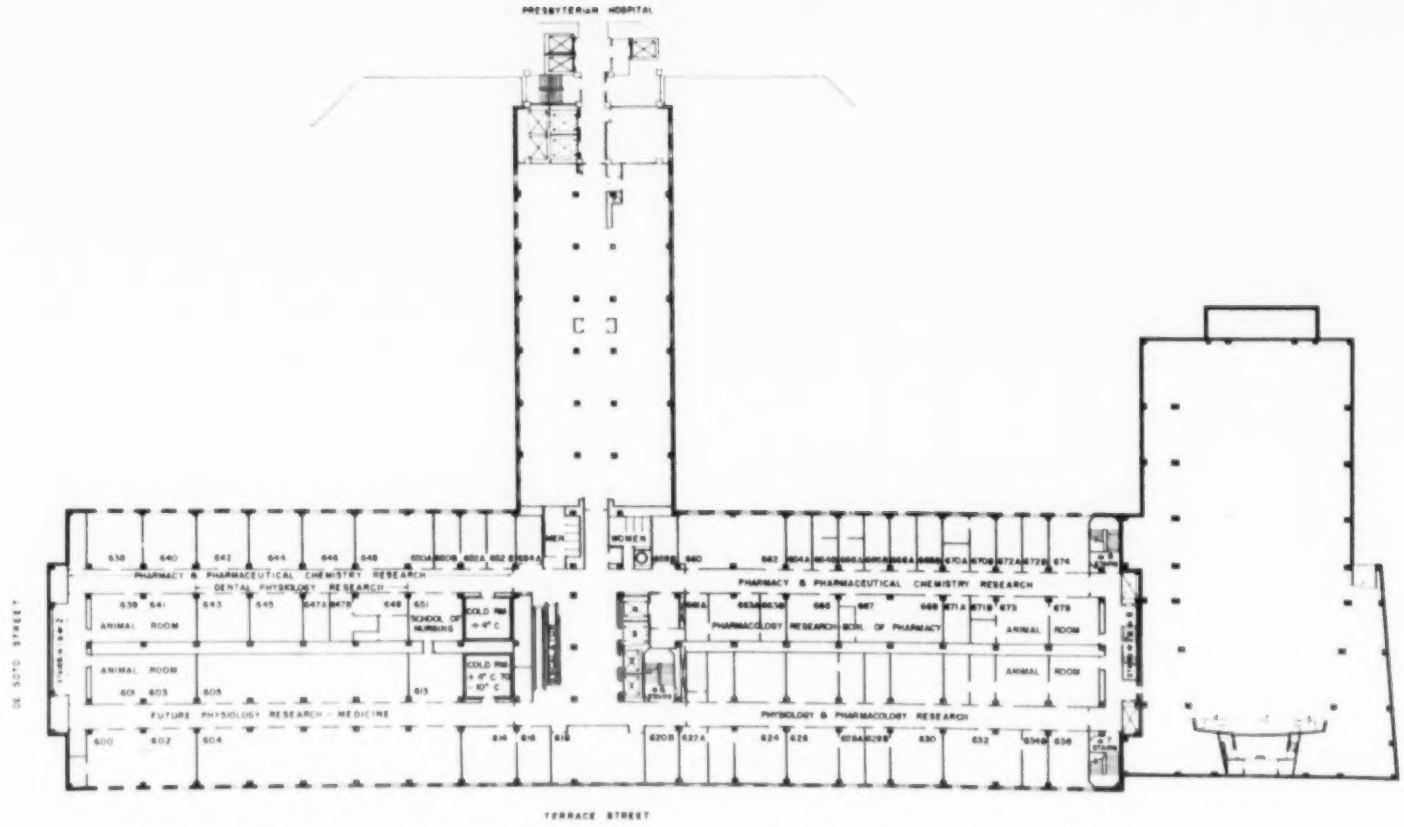

FIG. 14 SIXTH FLOOR PLAN, SCHOOLS OF THE HEALTH PROFESSIONS BUILDING, UNIVERSITY OF PITTSBURGH

student lockers, in a room whose partitions can easily be moved to meet new needs.

Also in the new building is a telephone exchange with a potential of 1,200 lines which gives twenty-four hour service seven days a week. There are at present twenty-seven trunk lines. The fire alarm for the building is connected to this switchboard.

One of the unique features of the new building is the integrating stairway which enables a person to go to the adjacent buildings without having to go to the outside.

Although there are many areas in the new building which are shared by all four groups, there are certain areas which have been designed exclusively for the use of the School of Pharmacy.

PHARMACY AREAS

The Pharmacy Laboratory on the fifth floor is for the exclusive use of the pharmacy students, and offers working space for a maximum of fifty-six of them. The only permanent fixtures in the room are the sinks. All other units, including the prescription counters, can be moved, providing unusual flexibility for the changing around of the laboratory as the need arises. Each student is provided with a general storage locker and a specialized locker which maintains equipment peculiar to the type of work he is doing. The laboratory is set up in such a way that there is a minimum of walking around. There is a storage and preparation room at each end of the laboratory, along with conference rooms in which can be held seminars and discussions on the particular phase of the experiments being conducted. Along the walls of the pharmacy lab are cases displaying manufacturers' specialty items, which are used for teaching in all four schools.

The Pharmaceutical Chemistry Laboratory, also on the fifth floor, is used for teaching qualitative and quantitative analysis and pharmaceutical chemistry. This lab is joined to the pharmacy lab described above and also has its own storage room. Offering working space to approximately fifty students, the lab is equipped with all of the utilities: hot and cold water, gas, electricity, etc. There are eighteen hoods lining the walls of this laboratory for the conducting of experiments. Each hood is equipped with its own utilities for the more convenient setting up of the projects.

The Undergraduate Pharmacology Laboratory on the fifth floor is used in active cooperation with the other health schools. It is shared by medical school pharmacology students, and often both groups share the same guest lecturers.

The Pharmacognosy Laboratory on the third floor is also shared by medical, nursing, microbiology, and dental histology students.

The main graduate laboratories for instruction and research in pharmaceutical areas are located on the sixth floor.

For purposes of experimentation and research which is conducted in all of the departments in the School of Pharmacy, animal rooms are provided, having their separate ventilation systems. Most of the labs and offices connected with research are concentrated on the sixth floor. Here the departmental offices are equipped with adjoining research labs, having their own autoclaves, deep freezes, refrigeration units, etc. The research rooms are air-conditioned, as are all departmental offices. Modern features of the research areas are two refrigerator

rooms which make it possible to carry on actual experiments in the rooms under ideal temperature conditions. There is a combination of such refrigerator rooms on every floor dealing with research.

The administrative offices for the School of Pharmacy are located on the second floor mezzanine. The three-room suite is air-conditioned and furnished in wood paneling.

Available for the use of the pharmacy students are twenty lecture and seminar rooms ranging in size from a capacity of twenty students to 150 students. These rooms are also available to all the schools. All of the teaching rooms have a back door and a front door to minimize confusion caused by latecomers. Fluorescent lighting embedded in the ceilings of the rooms is supplemented by excellent acoustic facilities. The chairs are upholstered, and tile has been used to finish the rooms. Each room contains outlets for audio visual material to supplement formal lecture material.

The pharmacy areas, in some instances, have not yet been completely equipped and furnished; new equipment is arriving every day. Classes have been in session, however, since September.

There is much further progress to be made, but the groundwork has been laid for one of the most modern health professions buildings anywhere. The School of Pharmacy anticipates many full and rich years ahead in its new home.

There is a vast difference between ethics and professionalism. A pharmacist can sell a sack of peanuts on a highly ethical basis; he can prepare and sell a bottle of medicine on a basis entirely unethical. We all know that. We should know, too, that the former transaction can never enjoy professional recognition, while the latter performance never occurs except on a professional basis. That is the basis upon which the hope of our profession rests, because it is the basis upon which, fundamentally, we are expected to operate.

R. A. Kuever, Am. J. Pharm. Ed., 6, 452 (1942)

A SIMULATED PRESCRIPTION DEPARTMENT IN TEACHING DISPENSING *

LOUIS D. KING

The use of a simulated prescription department in teaching dispensing pharmacy is not a new idea. A number of schools have derived the plans for their dispensing pharmacy laboratories by expanding typical prescription department layouts. This is done for the purpose of bringing as much reality into the academic setup as possible.

The simulated prescription department at Rutgers College of Pharmacy is new; and by describing our laboratory and its operation I hope to present some ideas which you may find of interest.

Our course in dispensing is based on the philosophy that a pharmacist is a professional man who is a technologist in the many areas that comprise the pharmacy discipline, in addition to being an expert technician in the field of dispensing pharmacy. The dispensing pharmacy course that we offer consists of two hours of lecture and two three-hour laboratory periods per week for each of the two semesters of the senior year.

1. Collecting prescriptions for the laboratory.

In an attempt to keep the work in dispensing as up to date as possible, practically all of the prescriptions used in the laboratory are from the current prescription files of pharmacies throughout New Jersey. These prescriptions are collected in several ways:

a. By visiting the pharmacies and photostating various prescriptions found in the current files, or by photographing these prescriptions on thirty-five millimeter film and preparing slides.

b. From inquiries from local pharmacists who have encountered problems in compounding or interpreting prescriptions.

c. From junior and senior students who are employed by local pharmacies.

2. Presenting the prescriptions to the students.

One hour of each laboratory period during the first four weeks of the fall semester is devoted to prescription reading practice. Slides are projected on the screen in the dispensing laboratory, and students are asked to read and explain the various prescriptions. The objectives are to familiarize the students with the various ways in which prescriptions may be written, as well as to give practice in the interpretation and abbreviations and handwriting. Many of these prescriptions involve principles and processes studied during the junior year. If this is the case, a student is asked to explain how the prescription may be compounded.

Prescriptions to be compounded in the laboratory are given to the students in several ways.

a. By projecting slides on the screen.

This procedure is used only during the early part of the year when many students have had little or no practice in reading and interpreting prescriptions.

b. By dictation.

* Presented to the Section of Teachers of Pharmacy, AACP, Miami Beach, Florida, 1955.

Before we give prescriptions by telephone, we attempt to train the student to record oral prescriptions as rapidly as possible. Prescriptions are read aloud, rapidly at first, then repeated at a slower pace until each student has correctly recorded all of the information. After a short time most students are able to record the prescription accurately during the first reading.

c. By telephone.

A large percentage of the prescriptions compounded in the laboratory are given by telephone. Various faculty members are asked to assist in this aspect of the laboratory, and often the student does not know who is dictating the prescription. Errors are often read into a prescription, and questions are asked about vehicles, suspending agents, and compounding procedures in order to keep the student aware of his responsibilities.

Proper telephone courtesy is stressed, and it is gratifying to see the progress made by many students during the year. Prescriptions are often given by telephone at a time when the students are engaged in filling previous prescriptions. This is annoying to many students, but they soon learn that such interruptions are to be expected in the pharmacy and adjust to the situation.

Various types of prescriptions are compounded during each laboratory period. A typical laboratory exercise may consist of a prescription for a folded powder, one for an ointment, one or more for solutions, and, perhaps, one prescription for a suspension. The number of prescriptions for the laboratory period varies from three to seven depending on the problems and procedures involved and the amount of practice the student has had in a particular technique. Seldom is an entire laboratory period devoted to one particular type of preparation. This variety is more in keeping with the general practice of pharmacy and tends to reduce the monotony of the laboratory work.

When techniques such as the preparation and use of buffered solutions are introduced in dispensing for the first time, an entire laboratory period is usually devoted to prescriptions involving this principle. Each student prepares the buffer solutions and prescriptions and checks the pH with narrow-range indicator papers. The final products are checked with a pH meter. This procedure serves to train the student in a method that is suitable for general compounding practice for buffered prescriptions, and to impress on him the importance of extreme accuracy.

3. Individual desks.

Each student is assigned a desk space that is separated from the adjacent desk by an opaque glass panel. Each desk is equipped with a class A prescription balance, a set of the most frequently used drugs and chemicals, a telephone earpiece, and a locker and drawer containing individual equipment and a stock of prescription bottles, boxes, and vials.

The individual equipment in each desk is based on the minimum equipment requirements established by the New Jersey State Board of Pharmacy. It is realized that in many cases this represents the equipment the student will have to work with in practice; therefore, we attempt to teach him to use it for the maximum efficiency.

Equipment that is not required for each laboratory period, such as tablet triturate molds, suppository molds, and homogenizers, is borrowed from the stock room as needed.

4. Utilities.

Two utility areas are provided in the center section of the laboratory. These are equipped with electrical and gas outlets, electrical hot plates, Bunsen burners, and water baths. The idea of having these facilities separated from the individual compounding desks is similar to the plan in most pharmacies.

Plans are now under way for the construction of two portable "Steri-Rx Chambers" similar to the one described by Parrott, Wurster, and Busse (1). These portable hoods will be placed on the utility counters adjacent to the sinks when the students are preparing sterile opthalmic preparations. This location is desirable since it will make possible the use of air ejectors for suction filtration, and is in keeping with the idea of using plans adaptable to the average prescription department.

5. Drug and chemical stock.

Drugs and chemicals which are used only a few times during a semester are stored on side shelves in the laboratory. Original containers are used where possible, and no attempt is made to keep the containers of uniform size or appearance. These materials are arranged alphabetically in three groups: solids, powders, tablets, and capsules in one group, liquids in the second, and finally ointments.

A special cabinet is provided for poisonous materials and another for narcotics. Dummy packages of a number of narcotic specialties are stored along with the materials used in the laboratory. This gives the student an opportunity to become familiar with these products and serves to impress on him that they are narcotics or poisonous substances and require special handling.

6. Prescription labels and records.

The laboratory facilities for labeling prescriptions are again copies of facilities found in a number of pharmacies. Special pharmacy typewriters, numbering machines, label moisteners, and a wide variety of labels are provided. The labels are stored in special drawers at the typing desk. The importance of selecting the correct size label and the proper auxiliary labels is stressed. The student is not permitted to erase an error made in typing and must arrange the directions on the label so that the final result is neat and well spaced.

We require the student to use a prescription record book to record the necessary information during several laboratory periods. The state laws of New Jersey require that each pharmacy maintain a prescription record of some type, and we attempt to give practice in the use of two systems, the conventional prescription record book and an indexed or alphabetical system.

7. Wrapping and pricing prescriptions.

During a part of the second semester each student is required to price and wrap one prescription per laboratory period. The necessary information for determining the cost of prescription ingredients is found in the copies of the *Blue Book*, the *Red Book*, and an assortment of manufacturers' catalogues included in the two sets of reference books provided in the laboratory. A record is made of the prescription prices suggested by the students, and the prices are discussed at the next laboratory period.

Paper and Scotch tape are provided for wrapping prescriptions, and instruction is given in proper wrapping procedure. Special labels are available for the wrapped packages.

8. Student dress.

Students are required to wear white professional jackets at all times in the laboratory. The students themselves feel that this adds to the professional atmosphere and take pride in keeping their jackets clean.

I feel the advantages of using a simulated prescription department in teaching dispensing pharmacy are:

a. An increased feeling of professionalism on the part of the student.

b. An increased sense of responsibility and neatness in the laboratory since each student is responsible for his work area, equipment, and chemicals, as well as encouraged to do his own problem solving.

c. A chance for the student to study and become familiar with some of the normal operation of a prescription department while under academic influence. This enables the graduate to evaluate methods and procedures used in the pharmacy where he is employed and to suggest improvements where needed.

REFERENCE

(1) Parrott, E. L., Dale E. Wurster, and L. W. Busse, *Pract. Ed., J. A. Ph. A.*, 14, 645 (1953).

That there is a place—and a great need—for specialists in pharmacy is certain, and our ideal curriculum should not be so inflexible as to retard the progress or dampen the enthusiasm of students obviously qualified for graduate study and research.

Howard C. Newton, Am. J. Pharm. Ed., 7, 444 (1943)

A DEPARTURE FROM THE CLASSIC ORDER IN GENERAL PHARMACY *

GEORGE E. OSBORNE

Pharmacy, as a subdivision of the pharmaceutical curriculum, deals with the principles, processes, and techniques which are ultimately involved in the fabrication of drugs and drug preparations and with the application of that knowledge and those techniques to the compounding and dispensing of prescriptions.

Thus have Blauch and Webster defined pharmacy; and general pharmacy, at least for the purpose of this paper, is understood to be derived by limiting their definition to the first portion: general pharmacy deals with the principles, processes, and techniques which are ultimately involved in the fabrication of drugs and drug preparations.

Traditionally, this subject matter has been treated in two separate divisions: first, courses generally known by some modification of the expression "principles and processes of pharmacy"; and second, courses involving, by whatever title, preparations of drugs. The first course begins usually with metrology, advances through the applications of physical principles in a very general way to pharmacy, and concludes with a series of discussions of concepts and processes, with bases in both physics and chemistry, to more specific pharmaceutical problems: solutions and solution, emulsions and emulsification, extractives and extraction, and particle size and mechanical subdivision of drugs. The second course takes up its subject topics in some such order as the one which, by virtue of its long use, may be called "classical": waters; solutions; syrups; mucilages; mixtures; magmas; lotions; gels; suspensions; jellies; elixirs; spirits; tinctures; fluidextracts; emulsions; liniments; ointments; cerates; creams; pastes; petroxolins; plasters; suppositories; powders and triturations; tablets; troches; pills; parenteral preparations.

Whereas no great argument against the established order is presented here, it is hoped that the ideas set forth may encourage a critical examination of that order by instructors of general pharmacy who may be dissatisfied with it, but who may be hesitant to deviate from it.

Two factors, operating simultaneously, have brought about a departure from the classical sequence at the University of Utah College of Pharmacy. First, the endeavor to torture the lecture topics of the "principles and processes" section of the course, usually offered on the semester plan, to conform to the time limitations of the quarter system pointed up the necessity for the excision of a large quantity of material, and a very logical removal was effected by a relocation of the topics applying to specific pharmaceutical problems to subsequent courses. Second, an analysis of the purposes of the laboratory exercises in the "preparations" half of the course dictated the policy that the laboratory training in operative pharmacy be set up primarily as a development of techniques. It was considered that the most fundamental techniques should be taught first, and it was considered that there are no techniques more fundamental than weighing and mixing. These are the only techniques to be practiced in the preparation of bulk powders and are still the basic ones involved in the preparation of any product that is

* Presented to the Section of Teachers of Pharmacy, AACP, Boston, 1954.

the result of the manipulation of dry powders; consequently, in the laboratory (and the lectures were organized to run concurrently with the laboratory pattern and schedule) these type classes were given precedence over the waters and solutions—which also nearly always require the handling of dry ingredients as well as liquid ones. After a careful study of the possibilities, frequent discussions of ideas with colleagues, free manipulation of the scheme, and five years of modifications, the following outline for the general pharmacy sequence at the University of Utah has evolved:

Principles and Processes of Pharmacy

I. Metrology
II. The physical properties of matter
  A. Density, specific gravity, and specific volume
  B. Viscosity
  C. Surface tension
  D. Optical properties
    1. Refraction
    2. Optical rotation
III. Heat and refrigeration
  A. Theory, generation and control of heat
  B. Heat as an agent in bringing about physical change
  C. Heat as an agent in bringing about chemical change
IV. Purification and clarification
  A. The separation of gases
  B. The separation of liquids
  C. The separation of solids
V. Preservation, packaging and labeling

Particle Size and the Mechanical Subdivision of Drugs

(Preparations that are made primarily by the manipulation of dry powders)

I. Bulk powder mixtures
  A. Bulk powders
  B. Triturations
  C. Oil sugars
  D. Species (Teas)
II. Divided powder mixtures
  A. Powder papers
  B. Wafers, cachets, and konseals
  C. Capsules
  D. Soft capsules
  E. Pearls and globules
  F. Sterile powders
III. Massed powder mixtures
  A. The "fusion" method—Granular effervescent salts
  B. The "wet" method
    1. Tablet triturates
    2. Hypodermic tablets
  C. The "Excipient" method
    1. Compressed tablets
    2. Pellets
    3. Masses
    4. Pills
    5. Troches and lozenges
    6. Jujubes
    7. Confections and honeys
    8. Candy medication
    9. Fumigating pastils

Theory of Solutions

(Preparations that are in the form of solutions)

I. Aqueous solutions
  A. Waters
    1. Solvent waters
    2. Aromatic waters
  B. Acids
  C. Liquores (pharmaceutical solutions)
  D. Injections and ampuls
  E. Juices
  F. Syrups

II. Hydroalcoholic and alcoholic solutions
  A. Elixirs
  B. Spirits
III. Oily solutions—oils
IV. Aqueous oily solutions for naso-pharyngeal use
  A. Sprays
  B. Nose drops
  C. Inhalants
  D. Gargles
  E. Swabs
  F. Expectorants

Theory of Colloids, Emulsions, and Suspensions
(Preparations that are primarily suspensions of one phase in another)
I. Colloidal systems
  A. Mucilages
  B. Gels and jellies
  C. Glycerites
  D. Collodions
II. Suspensions in liquid phases
  A. Liquid in liquid—emulsions
  B. Solid in liquid
    1. Magmas
    2. Mixtures
    3. Liniments
    4. Lotions
III. Suspensions in semi-solid phases
  A. Ointments
  B. Pastes
  C. Cerates
  D. Plasters
  E. Cataplasms
  F. Suppositories

Theory of Extraction
(Preparations that are made by processes of extraction)
I. Aqueous menstruums
  A. Infusions
  B. Decoctions
II. Hydroalcoholic and alcoholic menstruums
  A. Tinctures
  B. Fluidextracts
    1. Fluidacetracts
    2. Fluidglycerates
III. Special menstruums
  A. Resins
  B. Oleo-resins
  C. Non-pharmaceutical resinous products
    1. Oleo-gum-resins
    2. Balsams

It must be pointed out that, presently, the general pharmacy sequence is fortunate in having devoted to it some four courses, totaling fifteen quarter hours of credit, exclusive of a two-credit course in pharmaceutical calculations. The aim is toward an absorption of the calculations course and expansion of the scheme to a series of five courses, totaling nineteen credit hours, to be divided into (1) introduction to pharmacy, (2) preparations made primarily by the manipulation of dry powders, (3) preparations that are in the form of solutions, (4) preparations that are primarily suspensions of one phase in another, and (5) preparations that are made by processes of extraction. Each of the last four courses is to begin with a discussion of the theory, technology, and calculations involved in the particular segment of the discipline at hand, and then to proceed to a consideration of the type classes of preparations as examples of the progression of ideas set forth by the outline.

The type classes are now being studied using this plan:

I. Definition of the class
  A. Sub-classifications
  B. Characteristics of the class
  C. Exceptions
II. History and general information
III. Routes and methods of administration
IV. Advantages and disadvantages of the dose form
V. General incompatibilities of the class
VI. Packaging, preservation, and storage
VII. Techniques of preparation and official examples
  A. Hand methods
    1. General
    2. Individual
  B. Commercial methods and equipment

The listing of the individual preparations, as examples of the type class, again represents a departure from the established practice, which has been an alphabetical cataloging, first of the preparations in the *United States Pharmacopeia* and then of those in the *National Formulary*. Inasmuch as, by definition, beginning pharmacy concerns itself with the principles, processes, and techniques which are ultimately involved in the fabrication of drugs and drug preparations, it has been considered that a more meaningful, pharmaceutical grouping of the products in each type class might be made. To cite two simple examples, the official bulk powders are divided into those made by trituration (or mixing) alone and those made by a combination of mixing and sieving; the aromatic waters are grouped into those made by the distillation method and those made by solution (or dilution). Medicated ointments (as distinguished from ointment bases which are considered separately and previously) to give a more complex example are studied in these four categories:

I. Those ointments for which no directions are given
II. Those ointments prepared by emulsification
III. Those ointments prepared by fusion
IV. Those ointments prepared by incorporation
  A. By fusion and incorporation
  B. By solution and incorporation
  C. By levigation and incorporation
  D. By simple incorporation

In this way is pointed up the importance of the processes or techniques by which these preparations are made. Moreover, the quantity of information that the student must commit to memory is considerably reduced by the possibility of parallels that can be drawn, and the learning process is made easier by the organization of the material into relatively small, finite segments. In some type classes, however, the methods of manufacture are so very similar (e.g., capsules, tablets, injections, and elixirs—all fairly large classes, unfortunately) that a pharmaceutical segregation is not plausible. In these cases, the official examples have been grouped according to the pharmacological outline of the *New and Non-Official Remedies*, because the correlations here lead to the best organization of the material for the learning process.

It has been observed that usually, when a pharmaceutical grouping can be effected, a general formula and procedure can be derived that is applicable to each sub-assemblage of preparations. In cases where general formulas are, or have been, official (e.g., waters, infusions, decoctions, triturations, oil-sugars, etc.), they are used. In other cases, general formulas have been

derived from inspection of typical individual formulas. Thus, for example, a general formula for multiple-ingredient solutions would be:

Ingredient(s) R—soluble in water	X parts
Ingredient(s) S—soluble in an auxiliary solvent and usually insoluble in water	Y parts
Auxiliary Solvent(s)	Z parts
Purified Water, q.s.	
To make	Q cc.

And the procedure would be: Ingredients R and S are dissolved in their respective solvents. Then the water solution is added to the auxiliary solvent solution (in order to maintain a maximum quantity of auxiliary solvent at all times and minimize precipitation of water-insoluble ingredients). Finally, the product is clarified and then is made up to quantity with purified water.

It is intended, by working through such general formulas and by citing the official preparations as examples of a collection virtually of pharmaceutical "patterns," that a correlation can be drawn between the official preparations and a prescription of the same general formula: both should be compounded by the same general procedure. This correlation is a wide bridge between general pharmacy and dispensing pharmacy; in fact, it constitutes the very objectives of the earlier series. On completion of the series, the students should be able to approach any reasonable list of ingredients (e.g., an official formula) with some idea of how they can be put together to result in an acceptable product; the students, then, should enter upon their dispensing course to learn there how a list of ingredients (now, a prescription) *must* be put together to result in the most acceptable product. It is sincerely believed that the organization of the entire discipline of general pharmacy into an integrated series including physical pharmacy, principles and processes, pharmaceutical calculations, pharmaceutical technology, and pharmaceutical preparations has resulted and will result in the most significant contribution to the over-all curriculum in pharmacy by the course which, if dispensing pharmacy is to be called the "capstone" course, must certainly be referred to as the "cornerstone" of the curriculum.

And professional men need not believe that the responsibility for their shortcomings can be traced to anything or anybody but themselves.

R. A. Kuever, Am. J. Pharm. Ed., 6, 439 (1942)

PHYSICAL PHARMACY REDEFINED

BERNARD ECANOW

The term, physical pharmacy, is coming into common use, but as yet the rigid dimensions of a definition have not evolved. Busse (1) advances the thesis that it deals with the application of physical chemical principles and laws to pharmaceutical systems. I would like to suggest that the pharmaceutical systems involved must be limited to dosage forms.

The definition suggests that we are dealing with a branch of physics and chemistry. In this age of specialization, physics has proliferated into separate branches in which the primary objective is the application of the principles of physics to the viewpoint and functions of the specialized branch (2). The same may be said of chemistry. To obtain a name and identity of its own, the specialized branch must apply the methodology and ideas of physics and chemistry to functions which are uniquely its own. The functions which are uniquely pharmacy's involve the dosage forms. The definition, thus modified, becomes the application of physical chemical principles and laws applied to the study of dosage forms. Within these limits, certain subjects which are now taught under that title are clearly not physical pharmacy (3).

To encourage the study of physical pharmacy, many groups and individuals have recommended the study of subjects ranging from metrology to atomic structure as part of physical pharmacy. These recommendations bring the justified response that these subjects have been taught for years under various titles and in various courses. This misunderstanding creates the feeling that there is no need for such a subject as physical pharmacy or it creates the mistaken belief that such a subject is being taught.

A physical chemical approach to the synthesis of new drugs is becoming increasingly important. The methods and viewpoints involved in the synthesis of new drugs are not the same as those involved in the preparation and stabilization of a new dosage form. The viewpoint of the former regards the physical chemical forces present in biological systems as of primary importance, while the latter is primarily concerned with the physico-chemical forces present in an *in vitro* situation. Physical pharmaceutical chemistry would, therefore, not be properly taught and has no place in a course of physical pharmacy.

Physical chemistry, as such, should not be taught as physical pharmacy. Important selected topics of physical chemistry should be elaborated while being integrated into the study of dosage forms.

The advantages of thus redefining physical pharmacy are many. The physico-chemical study of dosage forms would become readily identifiable as physical pharmacy in the same manner as the physical chemical study of unit operations is identifiable as chemical engineering.

The preparation of dosage forms has historically been the art of pharmacy. The introduction of courses in physical pharmacy acknowledges and encourages pharmacy's evolution from an art to a science. Physical pharmacy, redefined, is essentially the art and science practiced by the product development sections of the large drug companies. This fact will become recognized as courses in physical pharmacy are developed, and this recognition can be used to recruit desirable students.

There is a large fund of knowledge about dosage forms available in the product development sections of the major manufacturers which should be made more readily available to students of pharmacy. It is important that all pharmacists have at least a semi-quantitative understanding of the dosage forms and that some pharmacists have a quantitative knowledge.

Physical pharmacy viewed in this light makes it obvious that there are no textbooks or laboratory manuals available for study along these lines. It suggests lines along which departments of pharmacy can develop their undergraduate programs. It suggests research problems, on the graduate level of pharmacy, which are worthy of pursuit in programs leading to the doctor of philosophy degree.

Physical pharmacy, e.g., the physico-chemical study of dosage forms, would also include the course in pharmaceutical technology as described by Blauch and Webster (4). It would thus include the study of how "(a) effective dosage forms may be prepared for specific purposes, and (b) vehicles may influence the rate or degree of activity of the drug, and (c) the effects of conditions and length of storage upon the stability of the preparation, and (d) the evaluation of pharmaceutic agents, processes, and types of dosage forms considered from the point of view of therapeutic efficiency" (5).

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We use neither wisdom nor far-sightedness in our growth. We are too busy living to bother about ordering our lives. While our professional skills and knowledge have improved and increased, we have allowed our ethical appreciations to go by the board.

R. A. Kuever, Am. J. Pharm. Ed., 6, 439 (1942)

EXPERIENCES WITH A SURVEY COURSE IN PHARMACOLOGY *

ARTHUR G. ZUPKO

In recent years many colleges of pharmacy have been providing a service to the profession of pharmacy and allied industries by conducting a refresher course each year. Generally these courses have been from one to three days in duration and the subject matter of a heterogeneous nature. Such an arrangment necessarily imposes a limitation on the amount and type of information available to the participant.

To provide a departure from the customary type of refresher course it was decided to offer a series of fifteen lectures over a fifteen-week period, exclusively in the field of pharmacology. It is the purpose of this paper to report on our experiences with this form of refresher course in the hope that it may stimulate others to give further thought to this type of adult education.

PLANNING AND CONDUCTING

A preliminary step in our planning was a telephone survey of potentially interested groups, including retail and hospital pharmacists, medical service representatives, research workers in industry, nurses, and others. A sizable number of these individuals indicated sufficient interest to encourage us to continue our planning. At about this time the Pharmacy Extension Service of Rutgers College of Pharmacy announced plans for a survey course in pharmacology similar to that contemplated by us. Advantage was taken of the experiences gained by Doctors Voigt and Rodman in planning and administering the lecture series at that institution.

Brochures announcing the contents of the non-credit survey course in pharmacology were sent to all alumni of the St. Louis College of Pharmacy and Allied Sciences, as well as to hospital pharmacists, directors of nursing education, industrial laboratories, medical service representatives, and retail pharmacists in the Greater St. Louis area. Registration cards, along with a request for payment of twenty dollars as tuition for the entire series of lectures, were enclosed with each brochure. Announcement of the course was also sent to various trade journals and publications. We then literally sat back and awaited results.

Approximately 5 per cent of the individuals contacted by mail replied and, much to our surprise, a total of 109 registered for the course. These included thirty-two retail pharmacists, twenty medical service representatives, three educators, nine nurses, eighteen hospital pharmacists, twenty-one research workers in industry, three graduate students, and three physicians. Such a heterogeneity of background and interest was sufficient cause for alarm to the lecturer, but this consideration was mere trivia when compared to the educational attainments of the group. A questionnaire given the class to complete at the first meeting revealed that it had nine registrants with Ph.D. degrees, three with M.D. degrees, seven with M.S. or M.A. degrees, sixty-two with B.S. or A.B. degrees, ten with Ph.G. degrees, nine with R.N. degrees, and nine with only a high school education. Approximately 75 per cent of the group were registered pharmacists. Only sixty-four of the group had had a fundamental course in physiology, and fifty-two had had training in biochemistry. A total of forty-seven had had both physiology and biochemistry, but thirty-nine had never been

* Submitted as a contribution of a member of the Committee on Problems and Plans.

exposed to either course. These findings represented quite a challenge, in fact, a challenge that continued throughout the entire course.

Lectures were given on Wednesday evenings from 7:00 to 9:15, with conference periods before and after each lecture to afford participants the opportunity of presenting special individual problems encountered. Mimeographed copies of each lecture were distributed just prior to each class meeting, and, when feasible, animals were used to demonstrate pharmacological drug actions. Despite the use of these and other teaching aids, each lecture became a race against time, usually resulting in an inadequate and superficial coverage of the material. One of the contributing factors was the inadequate preparation in the fundamentals of physiology and biochemistry of approximately half the group, necessitating some degree of briefing on these prerequisite subjects as they applied to the pharmacological topic at hand. Obviously such a procedure depleted even further the limited time available.

DISCUSSION

From these comments it might be inferred that such a course was not worthwhile. I should like to point out that, in spite of the aforementioned shortcomings, much benefit was derived by the participants. This became evident throughout the conference periods during which time many members of the group related experiences which indicated that information disseminated throughout the course had already proved valuable to them. In addition, questionnaires given the class at the end of the course indicated that each registrant considered the course worthwhile, although many suggested certain additions and deletions.

My experiences with the group paralleled those of Dr. Rodman of the Rutgers College of Pharmacy, who commented that he couldn't teach at the level he would like but didn't dare "talk down" to a group which included many with considerable education, experience, and maturity. One of the chief tasks confronting the lecturer is to strike a happy medium in his presentations. This is not always easy, but after a lecture or two he can readily discern the acceptability of material being presented. The conference periods are also an invaluable aid in this respect, enabling the lecturer to gauge how well the subject matter was received. There is no doubt that simplicity of explanation is always appreciated by all members of the group, irrespective of their educational backgrounds.

Discussions of recently marketed drugs as well as animal demonstrations of drug action commanded the greatest attention of the group. Generally it was found that theoretical considerations of drug action were the least appreciated. It is quite apparent that any course of this nature must be presented from a practical, rather than academic, standpoint. This is easily understandable when one considers the fact that these registrants came to class meetings after a full day at their respective chores and somewhat the worse for wear. It is not to be expected that such a group would be receptive toward material not ultimately having a practical application. It is, of course, impossible to dismiss completely all theoretical discussion, but it is advisable to keep it at a minimum.

Some comment regarding animal demonstrations is pertinent to this discussion. Owing to time limitations it is necessary to be selective in one's choice of demonstrations. In our experience preference should be given to those demonstrations which effectively dramatize the action of important drugs, i.e., morphine on the cat, dog, rabbit, and mouse. Convulsants and anticonvulsants, barbiturates and analeptics, curare and Tensilon, emetics and antiemetics are examples of other demonstrations which were well received. Attempts to dem-

onstrate autonomic activity on gut strips and hypotensive activity of drugs on dogs proved too laborious, time consuming, and ineffective from the standpoint of appreciation. Simplicity of set-up and effective dramatic action are the two necessary ingredients for a successful demonstration before such a group. The additional time and energy required to provide demonstrations are highly rewarding to the lecturer, at least judging from the complimentary comments received after each display of this nature. The value to the individual student is immeasurable, providing the demonstrations are successful.

Although no doubt can be cast as to the qualitative value to the individual of such a course, nevertheless it is apparent that the values received are quantitatively quite variable. Certainly the individual with no background in physiology or biochemistry could not possibly derive as much benefit from the course as the individual who has had these prerequisite subjects. The question arises as to whether or not it would be advisable to restrict enrollment to those with the necessary prerequisites. Personally I do not think it wise to prevent any individual from participating in an adult education course of this type, especially in view of the non-credit nature of the course. In actuality, course attendance stimulated many to study, where previous to the course the same people, self-admittedly, would not have attempted such a program.

It is suggested that certain required readings be made available to those lacking in the fundamental prerequisites. Doubtlessly such a procedure would be helpful but would, by no means, be the final answer. Many people are reluctant to do anything other than attend class meetings, preferring to have all the necessary information imparted at the time of the lecture. Several members of the class, however, requested readings with some degree of persistency and were most appreciative of receiving direction along these lines.

It is heartwarming for an educator to witness men and women who graduated ten to twenty years ago return to school and, week after week, faithfully attend lectures in the hope of self-improvement in the performance of their daily labor. One has only to observe such a group in session to realize that this type of course is far superior to the usual type of refresher course. To my knowledge no one has ever made a serious study of this latter type of course, particularly as to measurable values. Anyone completing a survey course of the nature described would deem it ludicrous even to attempt making a comparison with the usual three-day, hodge-podge refresher course.

Over a period of fifteen weeks the numerous professions represented within the group became quite friendly, and it was felt that the profession of pharmacy had gained considerable prestige among those outside of the profession. Certainly a large number of misconceptions regarding pharmacists' training were rectified. A better understanding of each other's role in the health professions was established. For these reasons it would be unwise to restrict this type of adult education to pharmacists alone.

It might be profitable to point out that pharmacology is but one of several areas in which survey courses might be instituted as so-called refresher courses. For example, pharmaceutical economics or pharmacy *per se* could certainly be conveniently adapted to an eight- or ten-week survey course. I am of the opinion that with some diligence and cooperation on the part of faculty members, coupled with adequate financial remuneration to the lecturer, this form of adult education should certainly be utilized. It would enhance the prestige of pharmacy and provide a much-needed service to those within the profession.

PHARMACEUTICAL MICROBIOLOGY LOOKS AHEAD *

GEORGE F. REDDISH

In a previous publication (1937) on teaching bacteriology to pharmacy students (1), the author stressed the value of a knowledge of the subject to the retail pharmacist. Later (1954) the importance of microbiology to the hospital pharmacist (2) was discussed with particular emphasis on certain medical aspects of the subject. It may be useful at this time to consider the future possibilities of the courses in microbiology, with special reference to means by which the subject may be more effectively presented for the ultimate benefit of both retail and hospital pharmacists, as well as for those who may become associated with certain of the pharmaceutical industries.

That such a need exists has been mentioned in recent reports of committees on pharmaceutical curriculum in which certain deficiencies in microbiology courses have been specifically noted. For example, Blauch and Webster (3) make the following statement:

> Microbiology, while receiving reasonable attention in most of the colleges, falls considerably short of meeting the need for such instruction in others. Courses of two- or three-semester-hours credit are not sufficient for the student to assimilate the basic principles of the subject to the extent that he can use them in his further study and his practice.

This is a clear statement of the present need for improvement with respect to this course.

Also, Blauch and Webster (4) further state "The amount of credit given for the course varies from two to ten semester hours, the average being about five semester hours." While the amount of credit for these courses varies considerably, the situation is further complicated by variations in the number of laboratory hours allowed for one credit semester hour. In many schools two hours of laboratory work are considered equivalent to one semester hour, whereas in others three or four laboratory hours equal one semester hour. The total credit hours suggested for courses in "general bacteriology" are thirty-two hours for didactic instruction and ninety-six hours for laboratory work (4).

The scope and content of different courses in microbiology presented to pharmacy students also covers a wide range, from brief elementary general courses in some schools to full courses in medical microbiology in others. While it is agreed by most authorities that the brief general courses are inadequate for the purpose, others consider the full medical course more extensive than necessary for pharmacy students. There is an area between these two extremes which may well be considered suitable for the purpose. Such courses should, however, be designed especially for students of pharmacy and should be specifically designated and listed in the pharmacy curriculums as "pharmaceutical microbiology."

Courses in pharmaceutical microbiology should, of course, include instruction in both general and medical microbiology, both adjusted to the needs of the future pharmacist. Exactly how this is done will vary to some extent in each college of pharmacy according to the facilities available, but

* Presented to the Section of Teachers of Biological Sciences, AACP, Miami Beach, Florida, 1955.

the course should be divided into two distinct parts, the first covering the fundamental aspects of the subject and the second the medical or strictly pharmaceutical phase. For obvious reasons the course should be presented to pharmacy students separately, that is, not combined with home economics, agricultural, and academic students, etc., as is often done at the present time.

These courses should also preferably cover two semesters, the first devoted to general microbiology and the second to the medical phase of the subject. The first semester would then include training in the preparation of culture media, sterilization procedures, staining techniques, isolation and identification of non-pathogenic microorganisms, the sanitary analysis of water, milk, and food, the testing of antiseptics, disinfectants, and fungicides, the sterility testing of liquids and solids, etc. The second semester would be devoted entirely to the isolation, identification, and study of pathogenic microorganisms, training and experience in bacteriologic diagnosis, the study of biologicals including vaccines and anti-sera, the antibiotics and chemotherapeutic agents, serological techniques used in diagnosis, etc. There are certain obvious advantages in dividing the course in this manner, one of which is that a whole semester is devoted to the pharmaceutical aspects of the subject. Another advantage is that students with advanced credit in general microbiology would not be required to repeat the first semester, but would be eligible for the second in which the medical aspects are emphasized.

The minimum time that should be required for such a course is also important. This has been the subject of considerable study by the official committee set up for the purpose. *The Pharmaceutical Curriculum* (5) and *The General Report of the Pharmaceutical Survey* (6) recommend that nine semester hours of credit be devoted to microbiology and public health, and it is also suggested that these subjects be given separately. This means, presumably, that six credit hours would be allowed for microbiology and three for public health. Although not specifically recommended, it would seem desirable and expedient to divide the six-credit-hour course in microbiology over two semesters, as just suggested.

If a six-credit-hour course is adopted and three credit hours are allowed for each semester, the semester hours for didactic and laboratory work can be adjusted accordingly. At the present time the number of laboratory hours equivalent to one credit hour varies in different schools and in some instances in different courses in the same school. According to *Accreditation Policy and Procedure* (1948) (7), "Three hours devoted wholly to laboratory work, two hours in courses requiring the continuous use of the microscope . . . shall be considered the minimum equivalent of one hour of classroom work." Since laboratory courses in microbiology do not require continuous use of the microscope, three hours of laboratory work should, therefore, be considered the minimum for one credit hour. Because of the nature of the instruction in microbiology at least two lecture hours each week are required which should then be followed by two laboratory periods. Since it would be impracticable to divide the minimum three hours suggested over two laboratory periods, the laboratory work should cover two periods of two hours each. The total of four hours devoted to laboratory would then equal one credit hour. While this is slightly more than the minimum suggested above, the total of three semester hours for each of two semesters or a total of six credit

hours for the course would then meet the recommendations of the Pharmaceutical Survey Committee (6).

At the present time this requirement, six credit hours, is maintained in the four year course in many pharmacy schools and is generally accepted as the absolute minimum in most curriculums suggested for the five and six year programs. This minimum has been specified by Blauch and Webster (8) and by certain recent committees on curriculum. It is evident that the regular course in pharmaceutical microbiology should carry six credit hours whether the curriculum covers four, five, or six years.

In addition to courses in pharmaceutical microbiology required of regular pharmacy students, some schools provide additional elective courses in advanced phases of the subject. Now that colleges of pharmacy are providing increased facilities to meet demands of future pharmacists, such advanced courses will no doubt be included in the extended five and six year programs. Such courses would be especially valuable in the training of future hospital pharmacists. As indicated previously (2), this advanced training would be especially useful to pharmacists in small hospitals. Although such courses are already available in certain pharmacy schools, they no doubt will become more general as the five year program is adopted by all colleges of pharmacy.

There is a present need for such advanced training of hospital pharmacists since a large number of small hospitals have neither a pharmacist nor a laboratory diagnostician. While it is desirable to have both, for economic reasons this is not always possible. However, if a well-trained hospital pharmacist could conduct some of the more important laboratory diagnostic procedures this problem would be solved to a large extent.

In a survey conducted by the Council on Medical Education and Hospitals of the American Medical Association, the results of which were published in 1954 (9), it was shown that of 6,840 hospitals registered, 931 had no laboratory department; and of the 5,087 general hospitals, 462 had no laboratory department; and of the 4,625 general hospitals with laboratory departments, 1,109 did not have a physician in charge. Also in a survey conducted by the American Hospital Association (10), of 6,076 hospitals reporting only 3,245 had their own pharmacies. From these surveys it is evident that a combination of pharmacist and laboratory diagnostician would be most useful, especially in small hospitals which cannot have separate departments for each.

As just stated, advanced courses in microbiology including special training in laboratory diagnosis are already offered by some pharmacy schools. The content of such courses varies to some extent according to the facilities available and whether the individual pharmacy schools have hospital or medical school associations. In this connection it is of interest to note suggestions made in the report of the Sub-Committee on Hospital Pharmacy of the American Association of Colleges of Pharmacy in 1953 (11). One of the specific recommendations with respect to advanced training of hospital pharmacists is that courses in bacteriology and serology be included. After noting the shortage of hospital pharmacists with such advanced training, the committee expressed the following warning: "There is a possibility pharmacy courses may be offered in some medical schools and/or by some schools of public health in universities where there are no schools of phar-

macy." This is a possibility unless or until colleges of pharmacy supply hospital pharmacists with the necessary advanced training indicated. This represents a challenge which should be met at this time. The regular courses in microbiology provided in most pharmacy schools at present are not fully adequate for the purpose. According to a report of the Committee on Microbiology and Public Health in the Pharmacy Curriculum (12), as well as in *The Pharmaceutical Curriculum* (3), training and experience in laboratory diagnosis was not included in the scope of the regular course in microbiology for pharmacy students. Since such training is not always emphasized in the regular courses, elective advanced courses in laboratory diagnosis should be made available.

In studies on the proposed five and six year curriculums, various committees have very properly placed the courses in microbiology in the professional curriculum and not in the pre-pharmacy program. In most instances this course is listed in the second professional year, while in a six year curriculum developed by one college of pharmacy, this first course is listed in the second professional year, which is followed by a course in medical microbiology in the fourth or final year. There are many reasons why the regular course should be given not earlier than the third professional year, that is, next to the last year. On account of the special requirements of the course and the nature of the instruction involved, the more mature and experienced the students are in matters of techniques, the better prepared they are for the course in microbiology in which both are exceedingly important. It is therefore suggested that the regular course in pharmaceutical microbiology be given in two semesters in the third or next-to-last professional year and that this be followed by a one-semester elective course in advanced microbiology in the final professional year.

Although in the *Accreditation Manual* (13) introductory courses in microbiology are classified in Group 2, which includes the basic biological sciences, there are adequate reasons why courses as described above and designated as "pharmaceutical microbiology" should be grouped with the other professional courses, that is in Group 3. Courses in first aid and public health, which are closely allied to pharmaceutical microbiology, are already included among the courses in professional instruction in Group 3. If instruction in this subject is to be of future value to the practicing pharmacist, as Blauch and Webster (4) indicate it should be, then it is deserving of a place in the professional group of courses in the pharmacy curriculum. That is, pharmaceutical microbiology as described above, and as distinguished from elementary introductory courses, should not be classified as a basic science, but as a professional subject.

In order for courses in pharmaceutical microbiology to deserve such professional classification, the scope and content must be designed accordingly. Such instruction must meet the expanding needs of retail, hospital, industrial pharmacists, and others if these courses will continue to serve the profession in the future. As we look ahead in planning courses in microbiology for pharmacy students, we should at least meet the present recommendations of curriculum committees with respect to this subject. After this is done further efforts should be made to increase the values and effectiveness of these and even additional courses in microbiology for the ultimate benefit of practicing pharmacists.

SUMMARY

1. Courses in pharmaceutical microbiology should include both general and medical aspects of the subject.
2. Such courses should carry a minimum of six credit hours divided into two semesters of three credit hours each.
3. The first semester should cover fundamental training in general microbiology, and the second should be devoted entirely to medical microbiology including the study of pathogenic microorganisms, laboratory diagnosis of the more important infectious diseases, vaccines, anti-sera, antibiotics, chemotherapeutic drugs, serologic techniques used in diagnosis, etc.
4. An elective course in advanced microbiology should be provided which would include extensive instruction in laboratory diagnosis, especially for students specializing in hospital pharmacy.
5. The regular course in pharmaceutical microbiology should be presented in the next-to-last professional year and the elective advanced course in the last professional year in the five and six year programs.
6. The emphasis in both courses should be directed to the present and future needs of professional pharmacists.

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The curriculum in a pharmacy school should be fluid, responsive, progressive, and always ahead of the present.

Glenn L. Jenkins, Am. J. Pharm. Ed., 8, 646 (1944)

THE EXPANDING ROLE OF PHARMACY ADMINISTRATION TRAINING IN THE PREPARATION OF PHARMACY STUDENTS FOR A CAREER *

SEYMOUR B. JEFFRIES

The primary objective of a college of pharmacy is to provide the pharmacy student with the type of undergraduate instructional program best calculated to equip him with as comprehensive and integrated a body of scientific and cultural knowledge and skills as he will need to perform properly all of the professional and entrepreneurial (and civic) functions required of him by a dynamic society, today as well as tomorrow.

If this is a valid restatement of the primary objective of a college of pharmacy, it is obvious that we, as educators, have a continuing twofold responsibility to the student:

(1) To keep abreast of the constantly changing economic and social trends and developments which directly or indirectly affect the pharmacist's professional functions and his entrepreneurial role in the community, and

(2) To shape and reshape our instructional program to conform to these changes.

In adopting the principle of the five year undergraduate instructional program, the colleges of pharmacy have demonstrated at least an apparent awareness of pharmacy's need to accommodate to the rapidly changing economic and sociological concepts dealing with public health and medical care. Whether this broad brush-stroke of leadership will be negated by rigid traditionalism in the realization is yet to be seen.

In any event, I see in the four years ahead, a magnificent opportunity for the planners in education to analyze and appraise, with candor and "lawyer" logic, the character of these changing economic and sociological concepts, and the nature of their impact upon the pharmacist's professional and entrepreneurial interests, emphasis, attitudes, and responsibilities.

As an active practitioner in the field of pharmacy administration, that is, as a management-consultant to a number of pharmaceutical associations and retail, wholesale, and manufacturing establishments in the middle Atlantic states area, and as a teacher of pharmacy admistration, I cannot help but be disturbed by the fact that so many of our leading educators in pharmacy either deliberately or unwittingly fail to appreciate the growing importance of providing the pharmacy graduate with a comprehensive understanding of the entrepreneurial philosophy and skills that are more than ever a part of practical pharmacy, regardless of the career eventually chosen.

Perhaps the most outstanding characteristic of pharmacy as a profession is that it is practiced for the most part in a retail store that, by custom and tradition, makes available for sale a large variety of merchandise, as well as services that are neither directly, nor even remotely, related to health needs or prescription practice. It is also the nature of practical pharmacy that the sale of these seem-

* Presented to the Section of Teachers of Pharmacy Administration, AACP, Miami Beach, Florida, 1955.

ingly "unrelated" products provides a substantial part of the income necessary to maintain and operate the professional facilities of the pharmacy.

In short, the professional-merchant entrepreneurial structure of pharmacy is well established, and no amount of wishful thinking is going to change it. As a matter of fact, it is because many pharmacists, in the past, accepted the challenge of social and economic growth in the community, and accepted the businessman responsibilities inherent in the dual role of professional-entrepreneur, that pharmacy was able to survive and progress as a profession. It was, I might add, this very pattern of entrepreneurial flexibility that enabled pharmacy to adapt so readily to the constantly changing conditions of demand and supply, to new governmental regulations, and to the many new forms and techniques of professional and retail competition.

But despite the fact that the professional-merchant-entrepreneurial structure is so firmly established, there are still many pharmacists who dislike the idea of having to engage in commercial activities. These men sincerely believe that the lay role of businessman is foreign and degrading to pharmacy as a profession, and detracts from their professional status in the community. They look upon *external manifestations* of business activity as the antithesis of professionalism, and dream of a golden era of "strict professionalism." And, as anomalous as it may seem, this feeling of guilt is shared by even the most commercially successful pharmacists.

In education, this same distaste for the businessman role the pharmacist has had to assume continues to manifest itself in an ever-increasing (and, I believe), unrealistic undergraduate emphasis on the scientific and professional areas of instruction, with but the slightest and most grudging recognition of the growing importance of preparing the student to cope with the pharmacist's expanding entrepreneurial role.

Quite bluntly, these well-meaning pharmacists, educators, and others who are, as they say, "stridently professional-minded," have not, as yet caught up to the present, let alone thought about the future. They not only refuse to accept the fact of commercialism in pharmacy, they also refuse to believe that the pharmacist's basic professional role—that of skilled craftsman and fabricator of the medication he dispenses—has changed at all.

Actually, there has been a radical change in the pharmacist's professional role, and, as a consequence, a change in his entrepreneurial role as well. With pharmaceutical manufacturing facilities expanding in every direction to meet the increased medical care needs of a growing, aging, and more health-conscious population, with increased medical and pharmaceutical research, with the establishment of higher and more effective standards, with the development of and acceptance of more complex forms of medication—way beyond the capacity of the prescription room—and finally, with the increased use of modern marketing, sales and advertising techniques to stimulate ethical demand for factory-fabricated medical specialties and proprietaries, prescription practice has, for the most part, been reduced from a professional, skilled craft to the common denominator of medical "specialty" dispensing.

This changeover in basic prescription practice from a craft to "specialty" dispensing has not only changed the pharmacist's professional role from that of a craftsman, whose knowledge and professional skills were needed and relied upon to manufacture medication, to that of a *professionally* trained and licensed distributor of prefabricated medication, but it has also made the technique of

business and commerce as important to professional success as pharmaceutical knowledge and traditional craftsmanship.

The need for sound and comprehensive training in the social and entrepreneurial arts and sciences is obviously not limited to retail pharmacy practice. For example, the same changeover in prescription practice from a craft to medical specialty dispensing has also taken place in hospital pharmacy with even greater emphasis on the entrepreneurial aspects of the operation. The pharmacy service of any moderate-sized (150 beds) hospital is considered to be "big business" both in terms of the volume of prescriptions dispensed and the dollar value of the inventory; and the pharmacist directing the service is expected to operate it in a *business-like way*, at a profit, or at least without running into the red. It is estimated that in hospitals with manufacturing facilities, 80 per cent or more of the pharmacy director's time is spent on entrepreneurial-managerial functions of one kind or another. In smaller hospitals, the percentage of time spent at the desk doing "paper" work, purchasing, inventory control, handling requisitions, etc., is somewhat smaller; in public institutions (hospitals, prisons, V.A., etc.) the amount of management detail work is prodigious. Needless to say, the graduate who enters this area of pharmacy practice is only *half prepared* without sufficient grounding in the management sciences.

Modern drug manufacturing and distribution has, as we have seen, changed the shape and form of "medical care" including the practice of pharmacy. However, the growth of medical specialty drug therapy has also created countless new career opportunities for pharmacy graduates: detailing, management control, marketing and marketing research, product research and development, communications (that is, medical advertising and journalism), and a variety of jobs in the drug wholesaling field.

To properly qualify for any one of these functions employed in bringing a drug from the "drawing board" to the patient, the pharmacy graduate must, in addition to possessing the necessary scientific and professional knowledge, have a firm grasp of the business principles, practices, and philosophy that give this vast complex of production and distribution direction and purpose. Even the researcher, the graduate who reaches out into the sciences to pluck new drugs out of the wonders of the human mind, has to understand the commercial, as well as the socio-economic dimensions of his field of operations, in order to reach the top.

Getting back to retailing (which, after all, is the career chosen by more than 75 per cent of our college graduates) and the fact that the pharmacist's traditional professional role has been drastically altered by the changeover in prescription practice from a craft to "specialty" dispensing, what can we do, or should I say, what must we do, to keep our students from feeling that they are graduating into a "licensed" trade rather than a profession? What "new" professional values and functions can we suggest to help him to develop to take the place of those lost to pharmacy; and which of the "traditional" professional functions remaining lend themselves to development and expansion in such a way as to *add value* to the sum total of the pharmacist's professional worth in community health? Are new professional as well as "traditional" functions and values to be found in the development of specific public health and civic responsibilities? If so, we must plan on a more comprehensive presentation of such courses as "sociological aspects of the practice of pharmacy," public health practices, techniques and problems, and public relations.

For years, even more so recently, one very important professional function has been emphasized as one of the most important professional services rendered by the pharmacist (particularly the retail pharmacist), that of ***adviser to physicians and other members of the health professions concerning the pharmacology and chemistry, the dosages and relative merits of the various dosage forms, their incompatibilities, side reactions and therapeutic characteristics, etc., and all drugs available to him for practice.*** This important professional service function has been stated and restated time and again as a reason for giving increased attention to the basic and applied sciences in undergradaute work in the colleges of pharmacy.

Substantively as well as in theory, this one single professional service is indeed valuable; in fact it goes to the very heart of that intangible we call professional knowledge which when added to a prefab drug makes the product the patient takes away with her a prescription. Isn't this the intangible that helps the physician maintain the very higher degree of standards of "patient safety" whenever he prescribes any kind of drug medication in the course of treating his patient?

In actual retail practice, however, the "adviser" service is very little more than academic. A regional study of pharmacist-physician contacts on the adviser-advisee plane revealed that they are so limited as to be non-existent. What few there were appeared to be limited to a very small number of the "so-called" professional pharmacies and hospital pharmacies.

Many reasons have been advanced to explain the absence of retailer "detailing" contacts: lack of time, lack of physician cooperation, poor physician-pharmacist relationships generally, the belief that physicians resent advice and interference from the pharmacist, and the belief that physicians prefer medical representative contacts for this purpose, etc. Not one of these reasons has real merit.

The fact remains that, while the retail pharmacist is best equipped by training in the basic and applied pharmaceutical sciences to provide physicians and other members of the health professions with this vital information, he is not "practically" equipped. He has never been formally indoctrinated to appreciate the socio-professional value and significance of this type of contact. He does not know how to go about making, or planning, a contact program; nor does he have any idea of how to conduct such a contact: what to say, what to do, or even how long to stay should he make a physician contact. In all likelihood he deliberately avoids any kind of contact because the physician is an "unknown" to him, and he believes that the physician feels the same way about him.

And all of this is our fault. Specifically, however, it is the fault of the well-meaning "professional purists" we spoke about earlier in our colleges of pharmacy, the men who forget about the world outside, who forget that academic theorizing about professional services and responsibilities is simply not enough. Repeating platitudes about the professional responsibility of rendering this important service without providing a *practical* plan or framework for discharging it, perhaps because a practical approach might debase it, or be an admission that the professional coin has a practical side, is the most unfortunate kind of educational myopia.

The potentialities for developing stronger professional ties inherent in this one type of physician contact are so great that every college should include as a ***required pharmacy administration course*** at least one or more of the following

suggested courses: "techniques of detailing the physician," "the development of an inter-professional relations program," "the nature and importance of inter-professional relations program," "the nature and importance of inter-professional relations in the practice of pharmacy," "the fundamentals of physician-pharmacist relationship in community medical care."

Before crying out in anguish that "pharmacy is no longer a profession," may I state categorically that such a conclusion is pure, unadulterated nonsense. The basic professional-entrepreneurial framework of pharmacy remains intact. All we are going through is a period of readjustment, a revaluation and redistribution of "emphasis" and "interests" within the very same sturdy framework.

And if it would be any comfort to know that we are not alone in our period of "agonizing readjustment," to borrow a phrase, it should be noted that medicine has also felt the slashing impact of medical specialty drug therapy on patient-physician relationships as well as professional status.

The fact is that "miracle drug" therapy has brought about a fundamental change in the public's valuation of the physician's, as well as the pharmacist's, contribution towards its health. It is even possible (and probably very likely), that the public's sharp outcries of pain about "high medical care costs" may be nothing more than a manifestation of this fundamental change. Certainly, any price, however reasonable, is bound to be regarded as high if the consumer's valuation of the commodity or professional service is low. Apparently, what pharmacy (and medicine) must do is build, rebuild, and add to the value of its contribution to the consumer's health and stress *value* rather than "low cost" *per se*.

After all, hasn't miracle drug therapy minimized, if not eliminated altogether, the old-fashioned "laying-on-of-the-hands" type of bedside medical care with its deeply personal patient-physician relationship, just as it has the "custom" compounded prescription which involved the application of manual professional skills? Perhaps the public misses this "physical contact" in modern medical care, and values both professions less because of the lack of it. In any event, both professions share the common problems of finding and developing new values and areas of professional service to the public. They are bound together by this commonality of experience and purpose as never before, and that is good!

May I conclude with a suggestion that each of us critically evaluate his own pharmacy administration curriculum in terms of pharmacy's changing professional and entrepreneurial roles with a view towards preparing the graduate to meet the ever-expanding cultural, social, and vocational needs of his profession and his community.

A broad and systematic research program is our only sure means of avoiding decay and promoting growth in the knowledge and skills which are the body and substance of our profession.

Forest J. Goodrich, Am. J. Pharm. Ed., 8, 431 (1944)

THE USE OF PHARMACEUTICAL EXTENSION IN DEVELOPING THE CASE-PROBLEM METHOD IN PHARMACY ADMINISTRATION *

RICHARD G. KEDERSHA AND JOHN L. VOIGT

The teaching of pharmacy administration courses has long been perplexing. The new instructor has found this to be especially true. This has been due primarily to the lack of information, research, and textbooks suitable to develop a completely satisfactory program. Furthermore, the diverse backgrounds of the teachers of pharmacy administration and the intangibles inherent in all business courses have further complicated matters. Also, as was evidenced at the Pharmacy Administration Section of the Teachers' Seminar on Pharmaceutical Education last year, there is little agreement as to the best method of teaching some of the subjects such as pharmacy management and pharmaceutical marketing (1).

In any discussion of teaching methods or objectives in a pharmacy administration program, consideration should be given to the environment in which those whom we teach will operate. This environment has been the scene of constant change. The past few years have seen great changes in the manner of distribution of many classes of goods formerly considered traditional to retail pharmacy. Obviously, to cope successfully with competition from many new non-drug outlets as well as the traditional competition, it is not enough to be equipped with "book learning," even if available, but pharmacists must have the power to deal with new and unfamiliar situations. This power can only be acquired by painstaking personal effort. The variety and complexity of situations encountered by pharmacists are so numerous that simplification into a logical system of specific answers to specific situations would be impossible. Furthermore, an experienced pharmacist finds that current problems cannot always be solved by using yesterday's solutions, since many new variables are constantly appearing.

Blauch and Webster (2) in their discussion of objectives in organization and management state the following:

> The subject matter would have more meaning if the student were actively engaged in the business operation which might be expected to yield sample situations that illustrate these principles. There are some difficulties in the way of bringing the generalities and the practicalities of pharmacy administration together during the student's time in college.

With this in mind it would seem logical to explore the case system as a means of providing the next best substitute.

What is a case? McNair and Hansen (3) define it,

> . . . as a statement of facts, opinions, and judgements more or less relevant to an actual business situation in which a problem exists and a decision must be made.

The primary purpose of the case method is not to provide factual knowledge. However, some such knowledge is gained by the student as a result of this type of study. When exposed to a case, a student is placed in the position

* Presented to the Section of Teachers of Pharmacy Administration, AACP, Miami Beach, Florida, 1955.

of a pharmacist faced with an administrative decision. Before acting, he must consider a host of different factors, both short-run and long-run in nature. The responsibility of weighing the advantages and disadvantages of all possible solutions and arriving at a definite decision rests with the student himself.

Some have contended that the use of the case method would tend to frustrate the student. Admittedly, it would be easier for the student if he had the comforting certainties of "specific answers" and "cold dope" which is characteristic of practically all the courses now being taught in pharmacy curricula. However, our students will soon be graduating and entering a business environment which is rampant with frustrations.

Rabe (4) has pointed out that there exists a danger that many senior students will have acquired the feeling that they know all that there is to know about the operation of a pharmacy by virtue of having worked in one or more stores. This danger is minimized since a student upon presentation of his solution to a particular case is then placed in a position of defending it against any objections of his classmates as well as those of his instructor. This certainly should dispel any preconceived notions or biased attitudes derived from his former employers. The ensuing spirited discussions, which are certain to arise, reveal to the student that there are many different approaches to business problems.

At Rutgers we have been fortunate in having a close liaison between our Pharmacy Administration and Pharmaceutical Extension departments. In the course of discussing many of our common problems, it became apparent that it would be mutually advantageous to coordinate our efforts. The Extension Office serves the pharmacists of the state of New Jersey in many ways (5). One important service rendered is that of personal consultation with any retail pharmacist requesting it. During the past five years well over a thousand visits to pharmacies have been made. Many of these have been as a result of request for aid in some problem of pharmacy operation. As a result of these visits and aid, the pharmacists of New Jersey have slowly gained an appreciation of the Extension Office. They have shown this by a willingness to cooperate on several surveys in the past. Many of them have consented to open up their operations for analysis and permit the anonymous use of these data for research purposes.

We are now in the process of collecting data for case studies. The Pharmacy Administration Department has given the Extension Office a list of possible topics for cases, and the type of information desired. The topics are patterned after the suggested curricula of Blauch and Webster (6). The emphasis is on the typical problems faced by the pharmacists and not on the rarely occurring ones. There is no special emphasis on case material where only good or bad practices are evident. We are trying to develop cases where there could be a difference of opinion on the proper decision. The entire effort is similar to the method used so successfully by the Harvard University Business School (7).

The Director of the Extension Office is in a strategic position to suggest additional case material by his close and frequent contacts with practicing pharmacists and their problems. His most valuable function is the location of sources of case material. Any material obtained is disguised to prevent the identification of the pharmacy. Those pharmacists who have al-

ready cooperated have not objected to phone calls for any supplementary information required.

The reaction of pharmacists to requests for permission to use their pharmacies has been gratifying. They feel flattered and actually welcome the opportunity to tell students how they handled a specific problem. The knowledge that actual pharmacy problems and cases are being written up for use in the classroom has had a profound effect on them. It dispels any preconceived notions of an "ivory tower" attitude of the pharmacy administration departments.

The adoption of a program of this type would result in the practicing pharmacists becoming more appreciative of the colleges and more receptive toward research in their respective pharmacies. This was proved by a class project conducted last year on retail pharmacy layout. Most of our senior class had close contact with some pharmacies. They were instructed to ask the owners for permission to plot the store dimensions on scaled sheets provided by the Johnson and Johnson Company. All obstacles, vents, and stairways were included. The students were given a brief lecture and reading assignment on the subject. They were then required to plot the layouts of the stores using the same fixtures but following the principles they had acquired. The results of the corrected project when shown to the pharmacy owners brought forth many favorable comments. Several actually called the college and stated that they were shifting their stores around to conform with the suggestions of the corrected plans. The students who didn't have any store contacts were assigned floor plans to work out.

We do not advocate the adoption of a program based entirely on the case-problem method. We believe the liberal use of cases, after supplementary lectures and selected reading assignments in texts and professional and trade journals, will be a step forward in improving our current methods of instruction. The use of trade journals for current information, statistical and otherwise, for secondary and source information as advocated by Olsen (8), should be a very important part of this program.

We believe that the adoption of a modified case-problem method, as outlined above, with the cooperation of a Pharmacy Extension Service will result in better teaching and in better Extension Service to pharmacies.

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PHARMACY ADMINISTRATION AT THE GRADUATE LEVEL *

ROBERT V. EVANSON

Two motivations exist in almost every kind of endeavor, if the desire to be of service to mankind is not considered. These motivations are self-preservation and self-progression. An individual desires to preserve his livelihood both physically and economically. He also desires to improve himself in his work and life so as to increase his personal, economic, and social standing. Within the profession of pharmacy these motivations have been directly responsible for the progressive interest in and build up of administrative, economic, or commercial curricula designed to aid the pharmacist in practice, and especially at the retail level.

Jurisprudence and business law are designed to provide an ethical and legal background necessary for the development of a sense of legal responsibility to society, as well as a fear of society's punishment for a lack of said responsibility. Merchandising and marketing should provide an over-all understanding of distribution practices in the drug industry at all levels. Management is expected to stress the important business aspects of drug-store operation in order to insure some measure of retail success. All of these courses have been added as a specific area of pharmacy administration for the purpose of training the Bachelor of Science in Pharmacy to the extent that he might become proficient as a retail pharmacist and store owner.

Action by the American Association of Colleges of Pharmacy recognized the importance of this area of instruction to the extent of requiring each member college to have someone of professorial rank in charge of the pharmacy administration curriculum by the fall term of 1953. Such action gave this area special stature in that it raised the core of courses to an equal level with the other four departments in pharmacy. This does not mean, however, that all schools have realized either the qualified instructional or departmental recognition which has been encouraged by that action. The situation will be alleviated just as soon as qualified instructors can be trained to fill the positions available. Great strides have been made in this direction, for which much credit can be attributed to the interest and support of the pharmacy deans and the American Foundation for Pharmaceutical Education.

Having established the department of pharmacy administration, educators have a responsibility to formulate some method of initiating and perpetuating the supply of qualified personnel for future placement and replacement needs. The task must naturally fall to those who have the training and experience to determine and provide the necessary program required to produce specialists. The specialists in turn, through research, will provide new subject matter in the area. Thus a need exists for a formal graduate program of pharmacy administration at both the M.S. and Ph.D. levels.

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* Presented to the Section of Teachers of Pharmacy Administration, AACP, Miami Beach, Florida, 1955.

Perhaps a brief elaboration of the need for such a program will help to indicate some of the possibilities for special development. As stated above, the demand today exists primarily for personnel to teach at the undergraduate level. Once this primary demand has been satisfied, the addition of a second man in the department is to be desired and will become mandatory in the future, if only to satisfy teaching loads to cover adequately and effectively the additions which are inevitable in an extended program of instruction. A second need exists in the manufacturing and wholesaling industries for men trained pharmaceutically but with major interests along such lines as sales and selling, market research and analysis, and statistical methods. Finally, there exists a trend toward providing graduate students in all areas of pharmacy with minors in pharmacy administration subjects with the design to better equip them for effective participation and advancement in the management of any organization.

A program of graduate instruction in pharmacy administration must be approached from a viewpoint of the total facilities and resources available to the college. Just as pharmacy utilizes chemical engineering courses and pharmaceutical chemistry is supplemented by chemistry courses, so must pharmacy administration look to and expect assistance from departments of economics, accounting, statistics, business administration, education, psychology, and others in order to provide a well-rounded program which will meet all of the students' requirements according to their academic objectives. The inclusion of the many different types of teachers peculiar to each discipline will provide the students with many different philosophies, attitudes, and methods from which they may develop those qualities which will add to their general and personal growth. Aside from these esthetic and developmental advantages, it would be impossible for any college of pharmacy to teach effectively all of the necessary courses with a one-, two-, or even three-man staff in this department.

Although no cataloged program exists in any of the colleges as yet (except for a few scattered graduate-numbered courses), there is no doubt that some of the schools are in the developmental stages and will offer both the M.S. and Ph.D. degrees in the near future. It is necessary that these schools subscribe to at least some basic requisites at each degree level. In general the requirements should equal or exceed those of a major in economics or business administration as defined by the graduate schools. Since it is unlikely that a student who is in training for a teaching career will wish to stop short of the Ph.D. degree, basic programs for both the M.S. and Ph.D. degrees are suggested below and are briefly described. Among other graduate prerequisites, all schools should require a B.S. in Pharmacy without exception. Prerequisites at the undergraduate level (included as a part of the B.S. degree or otherwise obtained prior to graduate instruction) should include one year of economics and one year of retailing. The latter may take the form of two semesters of drugstore management or one semester each of management and merchandising. Other undergraduate requirements should include some form of jurisprudence or law and ethics.

OUTLINE OF A BASIC GRADUATE PROGRAM IN PHARMACY ADMINISTRATION

Master of Science		**Doctor of Philosophy**	
Major		Major	
Marketing	3 hrs.	Marketing	6 hrs.
Retailing	3 hrs.	Retailing	6 hrs.
Management	3 hrs.	Management	6 hrs.
Elective	3 hrs.	Elective	6 hrs.
Total	12 hrs.	Total	24 hrs.
Minor #1		Minor #1	
Economics	6 hrs.	Economics	12 hrs.
Minor #2		Minor #2	
Pharmacy	6 hrs.	Pharmacy	6 hrs.
		Elective	6 hrs.
Research—Thesis		Research—Thesis	
Equivalent to 6 hrs.		Equivalent to 48 hrs.	
Language		Language	
One—German or French		One—German or French	
		Two—Substitute 6 hrs. of statistics.*	

* This substitution may vary depending upon educational objectives to include Advanced Accounting, Motion and Time Study, or other areas offered in 6-hour units.

A program as outlined provides an over-all required training and permits the student to inject a minimum of twelve hours of elective courses to fortify specific needs. For example, a teacher could well choose courses in education, psychology of teaching, the American college and university, or audio-visual aids for teachers. The student training for a place in industry could include such electives as industrial pharmacy, psychology of work efficiency, the interview in industry, motion and time study, and labor problems. The remainder, or majority, of the program is fixed, but only within the limits of general subject matter. It is necessary that one full minor be in economics (practical or theory) without exception. Since many schools require at least one minor from the other four departments, pharmacy is to be preferred to pharmacology, pharmacognosy, or pharmaceutical chemistry unless special interests dictate otherwise. This reasoning is suggested because of the direct association of industrial and hospital pharmacy courses to pharmacy administration in both academic instruction and future application.

Marketing, as stated above, includes all of the functions and agencies of distribution and their direct applications at all levels of operation. There should be at least one general course followed by a specific course applied to the drug trade. When a general course in marketing becomes required for all pharmacy curricula at the undergraduate level, both of the graduate courses may assume a specialty nature. The first course should or may be a straight textbook-lecture course, but the more advanced course should be a problems course which demands student participation in given case studies. Retailing, although a part of marketing, is listed here to indicate all that is defined at the undergraduate level as drugstore management and merchandising, but supersedes this definition to include the principles and practices

peculiar to all retailing. The six hours of retailing should be under the direct supervision of the professor of pharmacy administration and so constructed as to prepare the student to teach this material as a major educational objective. Substitutions may be made for retailing for students who are training for positions other than teaching.

Management does not include or mean drugstore management in any sense of definition. This subject area should be organized to provide a fundamental background in the accepted principles and practices of business management more commonly associated with executive development. A simple program may include a three-hour course each in basic management and in personnel management. A more elaborate program could utilize some or all of the elective credit.

The program as outlined also provides many interesting combinations of minors for non-administration majors. A full Ph.D. minor could supply sufficient background to enable a teacher in any of the other four departments to serve as an assistant to the pharmacy administration professor in order to utilize effectively a teaching staff on a contact basis. A management minor might well provide the basis and stimulus for the industrial pharmacy or product development major, or the research-minded pharmaceutical chemistry major, to become a future executive.

A graduate program in pharmacy administration has much to offer the profession of pharmacy and the pharmaceutical industry in the form of better-trained teachers, marketing specialists, other administrative specialists, department heads and executives, and last but not the least important, better-trained students at the B.S. level to operate the retail outlets so vital to the ultimate success of the drug industry. However, such a program cannot be offered by all colleges of pharmacy now or in the future because of a lack of total effective resources necessary. The present number of interested students is small, but an increase is certain as soon as the program is made available and job opportunities are made evident. Therefore, it is necessary that the teachers of pharmacy administration plan their graduate curricula wisely so as to turn out a product fundamentally sound in economics and marketing (here including retailing as a part of this general heading) and not ingrown with the philosophies and limitations of only two or three instructors. It is further suggested that in schools where formal degrees cannot be offered, the instructors should attempt to perform a service at the graduate level by providing at least sufficient course work to constitute a minor at the master's level consistent with the existing demand for credit hours and course content.

Because the department of pharmacy administration is literally an infant, its program of graduate instruction has been slow in taking form. It is expected that the demand for personnel will stimulate the initiation of such a program in more than one school. The program outlined here will provide fundamental training dependent upon the variability of course content. It is suggested that a future seminar program would perform a great service by studying the graduate program in pharmacy administration with specific objectives toward determining the need for teachers, the possibilities for job opportunities other than in the teaching profession, and a basic curriculum.

REPORT OF THE ALTERNATE DELEGATE TO THE AMERICAN PHARMACEUTICAL ASSOCIATION INTERIM MEETING

In accordance with the bylaw change at the 1956 Convention, the House of Delegates held its First Interim Meeting in Washington, D.C., November 10-11, 1956.

Under the able chairmanship of Dean Troy C. Daniels, the two-day meeting provided to be one of the best forums for American pharmacy ever attended by the writer. Of course, the absence of the many other attractions available at the Annual Convention, contributed to the success of this uninterrupted meeting.

Dr. Stephen Wilson, Chairman of the Committee on Social and Economic Relations, included in his report figures from the U.S. Bureau of the Census on population increase by age groups for the period 1940 to 1960. With special reference to the future manpower situation in pharmacy, he pointed out that pharmacy's share of the enlarged student enrollment anticipated in the coming decade would have to be carefully worked out and safeguarded. In subsequent discussions it was suggested that the House of Delegates provide information relative to pharmacy's manpower needs.

While there were no resolutions with direct bearing on education, the resolution and summary of action given below are deemed of interest to the AACP membership.

> *Resolved*, That the chairman of the House of Delegates designate a committee to consult with an outside specialized survey organization with the aim of developing a plan to determine what changes, if any, may be required in the organizational structure and objectives of the American Pharmaceutical Association to meet the present and future requirements of the pharmacists of the United States for the best type of service to the profession and to the public; to ascertain the staff and financial requirements to effectuate such a survey; and to report the outline of the plan and its costs to the next regular meeting of the House of Delegates.

This resolution was the result of Chairman Daniels' address and subsequent discussion from the floor. Dr. Daniels stated, ". . . unfortunately there is lacking the organizational structure that will insure all pharmacists the rightful privilege and opportunity to effectively participate in pharmacy affairs in a manner that is acceptable. . . . In order to serve all members of the profession, the American Pharmaceutical Association must be organized at both the county and state level. It needs to offer a service so vital and indispensable that membership in the Association is in effect essential for all pharmacists."

The House approved closer liaison with the Canadian Pharmaceutical Association and recommended that the Association establish a joint committee to foster programs of mutual interest. This action is of interest inasmuch as the AACP at the 1957 Convention will vote on a constitutional change to provide affiliate membership for Canadian colleges of pharmacy meeting the minimum standards of the Canadian Conference of Pharmaceutical Faculties.

Since schools of pharmacy are sometimes called on to provide information in cases of poisoning, the fact that there is an increasing interest in the establishment of poison information centers is worthy of mention. Dr. Arthur Zupko, in presenting this portion of the program, cited that such centers were already established in several of the larger metropolitan areas. Dr. Zupko is representing the A. Ph. A. in the coordinated movement to establish a national clearing house

for information on poisons. The House of Delegates endorsed a project to request the U.S. Public Health Service to establish such a clearing house. This responsibility has now been accepted by the U.S. Public Health Service, and as soon as this program has been initiated, information on poisons will be compiled and forwarded to the established information centers throughout the United States.

Charles W. Bliven
Alternate Delegate

We must always keep in mind the fact that the body of knowledge in use by any graduate at any time in any of the various practices of pharmacy is constantly shifting, and that such knowledge as is acquired or can be acquired by the pharmacy student during his pharmacy courses bears only a slight relationship to that which he acquires and puts to use later in life.

Glenn L. Jenkins, Am. J. Pharm. Ed., 8, 648 (1944)

EDITORIAL

This matter of pharmacy faculties working in drugstores seems to me to be fraught with incongruity. I've been told by my friends that I suffer from delusions of grandeur about the profession of teaching. If this be true, I make no apologies. I wish when I went to buy a steak, the butcher had delusions about his role in the economy of living—I'd get a better steak, better cut. I wish the man who repairs my shoes felt his job was the most important in town to keep the town on its feet—I'd get soles sewed on more neatly. I wish the man who fixes my car always took pride in seeing that it was taken care of in the best way he knew how, and that he knew more about it than anyone else—the motor would run better. Many of these people and many of you in the teaching profession have forgotten what it is to be proud of what you are and to be proud of what you do—and how you do it. In this country, I believe, as in no other we seem to be capitulating to economic and personal pressures at the expense of professional pride in our own stature as individuals or as individual parts of specialized groups.

Throughout our curricula we instill into students the professional ideals and ethics that are the heritage of pharmacy: that pharmacy is primarily a profession of service to the health of mankind, and that its prostitution to ridiculous extremes of merchandising is a blot on the escutcheon of four thousand years of dedication to the art of medication. If we hold that the profession should not capitulate to the materialism of our times and be so debased, how can we reconcile our thinking to materialistic motivation of our faculties who turn their backs on improving their teaching, postpone their research to some ill-defined future, and sell drugstore merchandise at every opportunity.

I trust there are none so naive as to think that when your students see you working behind a counter, they don't feel that you are out of place, and the more discerning—that you have let them down. If you sell teddy bears, they'll laugh behind your back!

I am reminded of a statement by Robert Maynard Hutchins: "The fact that popular misconceptions of the nature and purpose of universities originate in the fantastic misconduct of the universities themselves. . ." No wonder when I had my hair cut last week the barber commented on the salaries professors get for "nine months' work." I felt like pushing the lather brush down his throat. Show me a professor who works nine months a year at teaching and research, and I'll show you a failure. This misconception feeds on such activities as pharmacy faculties who farm themselves out in the summer at hourly wages equal to or less than their senior students get. I'm sure it must be the source of much levity among the pharmacists when they interview prospective employees to comment, "Why should I pay you more than I pay your professor?"

What is the reason pharmacy faculty members turn their backs on the profession of teaching and their obligation to research? Some give lip service to "keeping in touch with the practical aspects," "learning the changes in the retail fields," "helping out a friend." We'll put these in group one. The more candid confess: "I do it for the money." This is group two. To the first group I would

suggest (if these are true motivations) that you request permission to observe for your own benefit the activities in retail establishments to bring your thinking into current focus, a focus which could be more efficently obtained by reading the proper periodicals. If you work to help a friend, I would certainly assume that you do so at no cost. I never charge my friends for favors. For those who are out for the money, I suggest that you examine your conscience to see if the money is so essential to your subsistence at the expense of professional advancement. I've never heard a lecture that couldn't be improved. I've never seen a researcher who couldn't improve his output with more dedicated time. It seems to me that the extra gadget for the kitchen comes at rather a high price. Indeed, does anyone ever feel that he has too much money or too many "things"? I consort with few millionaires, but I'm told even they enjoy getting a free ticket to the baseball game!

Can we honestly feel that we can inspire a deeper and more active devotion in our students to the principles of ethical conduct of pharmacy when we fail to recognize the responsibilities of our own profession of teaching? To those of you who will sell your reputation as searchers and disseminators of truth this summer for a few dollars an hour, I can only suggest that you think about the comment of the 1947 President's Commission on Higher Education, which states that the concept of scholarship needs to be reformulated to include "skill in communicating attitudes as well as facts."

Melvin R. Gibson

No school can have greater prestige than the composite prestige of its faculty.
Glenn L. Jenkins, Am. J. Pharm. Ed., 9, 566 (1945)

DR. LYMAN COMMENTS

In the July, 1956, number of the magazine, *Coronet,* is an article written by Helen Itria entitled, "The Rejuvenation of Jennie." The article carries a moral which deserves the consideration of all those engaged in any and every form of pharmaceutical activity and who are currently so concerned with the improvement of pharmacy's relation with the public. It should be especially noted by those druggists who purvey alcoholic liquors from their drugstores but want to be members of the public health team and wish to have their stores recognized as public health institutions. Permission to review this article and publish it in our journal has been granted by the Editor of *Coronet,* Mr. Lewis W. Gillenson.

Here are the highlights of Jennie's career. She was born in Russia of Jewish parents. Her cantor father had been advised that there was money in making and selling paper bags. His desire was to make enough to send his family to America. He set his daughters at making bags, and seven-year-old Jennie sold them and made enough money to send two sisters to America. In 1913 Jennie followed them to Philadelphia. There she shocked her family by getting a job in a dressmaking factory and becoming a "common laborer." But Jennie had executive ability. In 1915 she helped to organize the Waist and Dressmakers Group, Local No. 15, and later the Air and Sunshine League, in Philadelphia, for consumptives. Then she committed a final "sin" by marrying Max Lesnick. Her family opposed, not because of Max, but because of his occupation. He drove a truck. After some time they decided to go west and eventually drifted into a beer and wine business in the lowest section of Los Angeles.

Years passed and in January of 1953 Jennie learned that her four-year-old granddaughter, Patricia, had but a few days to live. The doctor told her Patricia had cystic fibrosis of the pancreas, a disease that afflicts approximately one child out of every 600 born, and is almost always fatal. Jennie's whole world was centered around little Patricia. Patricia died on January 28, 1953. Jennie was stunned.

At the funeral the rabbi said: "We are all messengers of God. God gives and God takes. We do not know what this little girl's purpose was, but she served her time, completed her mission and now is gone."

For two weeks Jennie spoke to no one but her husband. She sat and stared, hearing only the words "purpose . . . mission . . . purpose!" Then she raised the question as to why she was running a beer joint when she might be doing something better. She asked "What am I working for? What am I living for?" Then it came to her that the purpose might be that she could do something to save other children from being taken away.

She appealed to Dr. Howard Drake of the Moore-White Clinic, who had once operated upon Patricia, to tell her what could be done about the control of this disease. Dr. Drake's answer was in one word: "Research." That meant a medical foundation and he warned, "It would take hard work, money, and time to tax the patience."

Then the decision to create a foundation was made. Jennie had once been a successful organizer. She could do it again. With the help of the doctors who had served Patricia, she made plans for a foundation. The CBS put her on the TV show, "There's One In Every Family." She won $135 which became the nest egg. In 1954 the "Cystic Fibrosis Foundation" was born. Los Angeles metropolitan newspapers carried stories about the Foundation. Letters were sent to 5,000 pediatricians throughout the country, pamphlets were distributed to the public, a film was made showing the research being done in the Childrens' Hospital, the showing of which created further interest. Soon money began coming in from service clubs, sororities, and individuals in all walks of life.

Nine Cystic Fibrosis chapters were formed in California, and so great was the interest created in the nation that chapters were organized in twenty-five states and $100,000 has been collected. For thousands of parents of children who have been living without hope, Jennie has given them a chance to hope.

But what about Jennie? Does she still operate her beer joint and joke with the customers, content to bask in the well-earned feeling of self-satisfaction? No, not Jennie. The beer parlor was the first casualty. "How would it look for me to be running such a place now?" she asked. "One look at the characters, one sniff of stale beer, and before you know it the Foundation will lose all stature because of me." Jennie is devoting her time and talents to the organization of groups and clubs into chapters. She says, "Maybe I won't live to see a cure but it's started now, this mission, and God will see it through."

Beyond a doubt this was Patricia Lesnick's legacy. In dying, she showed her grandmother how to live.

And by living, Jennie Lesnick, by her own example has shown pharmacists the incongruity of purveying alcoholic beverages by a pharmacist who claims to be a member of the public health team from a drugstore which he wants to be labeled a public health institution. Alcoholic liquors are known by the public to be the bedfellows of prostitution and a major factor in causing delinquency, inefficiency, disease and its spread, and crime. If it is our desire to increase the status of pharmacy with the public, the time has come to eliminate alcoholic beverages from the drugstore. If we have the courage of Jennie Lesnick it can be done. That act will be more effective in elevating pharmacy professionally than all the advertising in newspapers that pharmacy works for public health, or all the pharmacy week ideas ever conceived to make the public and the other health professions recognize the value of the service the pharmacist renders to community life.

Rufus A. Lyman

Efforts to overcrowd the curriculum lead to superficiality, to inaccuracy, and to mediocrity on the part of faculties as well as on the part of students.

Glenn L. Jenkins, Am. J. Pharm. Ed., 8, 648 (1944)

ANNOUNCEMENTS . . . . . .

Pharmacology Seminar. The Ninth Annual Teachers' Seminar sponsored by the American Association of Colleges of Pharmacy and supported by the American Foundation for Pharmaceutical Education, this year devoted to the subject pharmacology, will be held Sunday, July 14, through Friday, July 19, at the University of Washington. Most meetings will be held in the Health Sciences Building on the University campus. Seminarians and their families will be housed in the modern men's residence hall at reasonable rates or at the Edmond Meany Hotel.

The faculty for the Seminar is as follows: John G. Adams, Ph.D. (Dean, School of Pharmacy, Duquesne University); Dale R. Lindsay, Ph.D. (Assistant Chief, Division of Research Grants, National Institutes of Health); Henry K. Beecher, M.D. (Dorr Professor of Research and Anesthesia, Harvard Medical School, Massachusetts General Hospital); Howard M. Bilden (Sales Promotion Manager, Ciba Pharmaceutical Products, Inc.); W. Paul Briggs, Ph.D. (Secretary and Executive Director, American Foundation for Pharmaceutical Education); Robert A. Bruce, M.D. (Associate Professor of Medicine, School of Medicine, University of Washington); Troy C. Daniels, Ph.D. (Dean, School of Pharmacy, University of California); John E. Davis, Ph.D. (Professor of Pharmacology, College of Pharmacy, University of Texas); James M. Dille, Ph.D., M.D. (Professor of Pharmacology, School of Medicine, University of Washington); Theodore L. Dorpat, M.D., (Instructor of Psychiatry, School of Medicine, University of Washington); Victor A. Drill, Ph.D., M.D. (Director of Biological Research, G. D. Searle and Company); Alfred E. Farah, M.D. (Professor of Pharmacology, College of Medicine, State University of New York); Edward Fingl, Ph.D. (Assistant Professor of Pharmacology, College of Medicine, University of Utah); Melvin W. Green, Ph.D. (Director of Educational Relations, American Council on Pharmaceutical Education); Thomas J. Haley, Ph.D. (Chief, Division of Pharmacology and Toxicology, Atomic Energy Project, University of California at Los Angeles); Akira Horita, Ph.D. (Instructor of Pharmacology, School of Medicine, University of Washington); J. C. Kopet, Ph.D. (Manager, North Hill Drug Store, Spokane, Washington); Chauncey D. Leake, Ph.D. (Assistant Dean and Professor of Physiological Chemistry and Pharmacology, College of Medicine, Ohio State University); Jack E. Orr, Ph.D. (Dean, College of Pharmacy, University of Washington); Tom D. Rowe, Ph.D. (President, AACP, and Dean, College of Pharmacy, University of Michigan); Robert F. Rushmer, M.D. (Professor of Physiology and Biophysics, School of Medicine, University of Washington); Ewart A. Swinyard, Ph.D. (Professor of Pharmacology, College of Pharmacy, University of Utah); E. Leong Way, Ph.D. (Associate Professor of Pharmacology, School of Medicine, University of California); George L. Webster, Ph.D. (Secretary-Treasurer, AACP, and Professor of Chemistry, College of Pharmacy, University of Illinois); Theodore C. West, Ph.D. (Assistant Professor of Pharmacology, School of Medicine, University of Washington); Louis C. Zopf, Sc.D. (Chairman, Executive Committee, AACP, and Dean, College of Pharmacy, State University of Iowa).

Ninth Annual Teachers' Seminar
Pharmacology

Sunday Evening, July 14

Buffet Supper

Dr. Jack E. Orr, Presiding

8:00 Greetings from Dr. Henry Schmitz, President of the University of Washington
Greetings from the American Foundation for Pharmaceutical Education —Dr. W. Paul Briggs
Address by Dr. Chauncey D. Leake

Monday, July 15
Inventory and Prospectus
Dr. Ewart A. Swinyard, Chairman

9:00 Opening Remarks
9:05 The Status and Needs of Pharmacology in the Pharmaceutical Curriculum—Dr. Melvin W. Green
9:35 Discussion
9:45 The Use of Pharmacology in Retail Pharmacy—Dr. J. C. Kopet
10:05 Discussion
10:15 Coffee
10:35 The Use of Pharmacology in Hospital Pharmacy—Dr. Louis C. Zopf
10:55 Discussion
11:05 The Use of Pharmacology in Industry—Dr. Victor A. Drill
11:25 Discussion
11:35 The Use of Pharmacology in Detailing—Mr. Howard M. Bilden
11:55 Discussion
Luncheon
2:00 Optimum Prerequisites to the Undergraduate Course in Pharmacology—Dr. Troy C. Daniels
2:30 Discussion
2:45 Pharmacology in the Pharmaceutical Curriculum of the Future—Dr. John G. Adams
3:15 Discussion
3:30 Coffee
3:45 Discussion and Summary

Tuesday, July 16
Mechanisms and Methods in Pharmacology
Dr. Troy C. Daniels, Chairman

9:00 Opening Remarks
9:05 Biochemical Approach to Pharmacology—Dr. Alfred E. Farah
9:35 Discussion
9:45 Laboratory Evaluation of Drugs—Dr. Ewart A. Swinyard
10:15 Discussion
10:25 Coffee
10:40 Clinical Evaluation of Drugs—Dr. Henry K. Beecher
11:10 Discussion
11:20 Experimental Design—Dr. Edward Fingl
11:50 Discussion

Group Discussion on Problems of Drug Mechanisms, Drug Evaluation, and Experimental Design
(Dr. Alfred E. Farah, Dr. Henry K. Beecher, and Dr. Edward Fingl)

2:00 Session I
2:55 Coffee
3:10 Session II

Wednesday, July 17
Interpretation of Drug Effects on the Heart
Dr. Theodore C. West, Chairman

9:00 Opening Remarks
9:05 Basic Concepts of Cardiac Pharmacology—Dr. Alfred E. Farah
9:25 Discussion
9:35 Laboratory Approaches: Unicellular Recording—Dr. Theodore C. West
10:05 Discussion
10:15 Coffee
10:30 Laboratory Approaches: Ventricular Performance and Its Measurement—Dr. Robert F. Rushmer
11:10 Discussion

11:20 Laboratory Approaches: Cardiac Drugs on Biochemical Processes—Dr. Alfred Farah
12:00 Discussion
2:00 Clinical Approaches—Dr. Robert A. Bruce
2:45 Discussion
2:55 Round Table and Discussion: Importance of Animal Experiments to the Clinical Use of Cardiac Drugs
3:45 Coffee
4:00 Demonstrations:
Microelectrode Recording from Heart Muscle
Recording Ventricular Function in the Dog
Recording Cardiac Function in the Human

Thursday, July 18

Current Concepts in Psychopharmacology

Dr. James M. Dille, Chairman

9:00 Opening Remarks
9:30 A Survey of the Mood Altering Drugs—Dr. Chauncey D. Leake
10:15 Discussion
10:30 Coffee
10:40 Biochemical Approach to Mental Illness—Dr. Akira Horita
11:30 Discussion
2:00 The Pharmacological Approach to Mental Illness—Dr. Thomas J. Haley
2:45 Discussion
3:00 Coffee
3:15 Clinical Problems and the Psychopharmacological Agents—Dr. Theodore L. Dorpat
3:45 Discussion and Summary

Friday, July 19

Graduate Training and Research in Pharmacology

Dr. George L. Webster, Chairman

9:00 Opening Remarks
9:05 Objectives of Graduate Training in Pharmacology—Dr. Victor A. Drill
9:35 Discussion
9:45 Prerequisites for the Pharmacology Graduate Student—Dr. E. Leong Way
10:15 Discussion
10:25 Coffee
10:40 Supplemental Training at the Graduate Level—Dr. Ewart A. Swinyard
11:10 Discussion
11:20 The Development of a Pharmacology Research Program—Dr. John E. Davis
11:50 Discussion
2:00 Financial Support for Research—Dr. Dale R. Lindsay
2:40 Discussion
2:50 The Importance of Professional Affiliation to a Graduate Program in Pharmacology—Dr. James M. Dille
3:10 Discussion
3:20 Concluding Remarks—Dr. Tom D. Rowe

The Seminar committee is composed of the following: from the University of Washington, Dr. Jack E. Orr, chairman, Dr. James M. Dille, Dr. N. A. Hall, and Dr. T. C. West; from the University of Utah, Dr. Ewart A. Swinyard; from the Association, Dr. George L. Webster and Dr. Louis C. Zopf.

Dunning Memorial Fellowship. The American Foundation for Pharmaceutical Education announces receipt of a gift from The H. A. B. Dunning Foundation, Inc., establishing an annual graduate Fellowship in the name of H. A. B. Dunning.

Henry Armitt Brown Dunning, fourth President of the American Foundation for Pharmaceutical Education (1952-1953), was born in Denton, Maryland. He graduated from the Maryland College of Pharmacy in time to volunteer for service in the Spanish-American War. After the war he continued his education at the Johns Hopkins University. Here his original research work led to the dis-

covery of several important medicinals in the field of synthetic organic chemistry.

In 1901 he became a partner in the professional pharmacy of Hynson, Westcott & Company, Baltimore, Maryland. The new firm, under the present name of Hynson, Westcott & Dunning, Inc., is an important manufacturer of prescription drugs and diagnostic agents, distributed throughout the world. He is now Chairman of the Board of Directors of his company.

Dr. H. A. B. Dunning holds Ph.G. and Phar. D. degrees in course from the University of Maryland and honorary degrees of Doctor of Science from the University of Maryland, Ph.M. from the Philadelphia College of Pharmacy and Science, LL.D. from Johns Hopkins University, and Doctor of Science from Washington College. For many years he was Professor of Chemistry, Department of Pharmacy, University of Maryland.

He is a past President of the American Pharmaceutical Association, and, as Chairman of the Association's Pharmacy Headquarters Building Fund, was largely responsible for the unique site and magnificent building in Washington, D.C., housing the Association.

Dr. Dunning is Vice President of the Maryland Home for Incurables, and member of the Board of Directors, Y.M.C.A. His many philanthropies include educational institutions, various Maryland and Baltimore charities and churches. He established the Science Building at Washington College and, on Constitution Avenue in Washington, D.C., the National Memorial to Pharmacists serving in the wars of our country.

By a gift from The H. A. B. Dunning Foundation, Inc., an annual H. A. B. Dunning Memorial Fellowship is awarded in honor of this distinguished scientist, pharmacist, administrator and philanthropist.

All Memorial Fellowship recipients are selected by the AFPE Board of Grants, from among the total applicants for Foundation Fellowships.

Other memorial programs of the Foundation are: Gustavus A. Pfeiffer Memorial Postdoctoral Fellowships; Edwin Leigh Newcomb Memorial Awards; Sydnor Barksdale Penick Memorial Fellowships; E. Mead Johnson Memorial Fellowships; Charles R. Walgreen Memorial Fellowships.

Residencies with Civil Service. The United States Civil Service Commission announces that applications are now being accepted for residencies in hospital pharmacy for duty in Veterans Administration hospitals and centers in various cities throughout the United States.

The residency is twenty-two months in length and consists of part-time work in hospital and out-patient pharmacy and graduate study in pharmacy at a cooperating university. Residents receive $2.18 an hour and are employed approximately twenty-eight hours a week. Applicants must have completed a four-year course in pharmacy and have a bachelor's degree. They must be currently registered as a pharmacist.

Further information and application forms may be obtained at many post offices throughout the country, or from the United States Civil Service Commission, Washington 25, D.C. For residencies beginning February 1, 1958, applicants should file their applications with the Central Board of U.S. Civil Service Examiners, Veterans Administration, Washington 25, D.C., not later than October 1, 1957. Applicants who wish to be considered for residency begin-

ning September 1, 1958, should file their applications so that they will be received on or before May 1, 1958.

Columbia course for librarians. In response to a formal request from the Joint Committee on Pharmacy College Libraries of the American Association of Colleges of Pharmacy, and as part of its enlarged program for special librarians in service and in training, Columbia University's School of Library Service is offering a course in pharmaceutical literature and librarianship during the coming Summer Session. The instructor will be Mrs. Irene M. Strieby, who for many years was Librarian of Eli Lilly and Co. and who is now Library Consultant for that company. A former president of the Special Libraries Association, Mrs. Strieby is well known in the special library field through her contributions to professional literature and her activities in the professional associations, especially, her contributions to education for special librarianship through membership on committees such as the Joint Committee on Library Education of the CNLA and the Joint Committee on Pharmacy College Libraries of the AACP.

The course will provide a survey and evaluation of library materials in the field of pharmacy, with emphasis on bibliographical and information sources, special service problems and organization in pharmaceutical and pharmacy college libraries.

Although designed as advanced in-service training for professional librarians now in service, the course may be taken for regular credit toward the School of Library Service's M.S. degree. In order to make it available to librarians on short leave, the course has been scheduled to meet two hours daily from Monday through Friday for the last three weeks of the Summer Session (July 29-August 16) from 7 to 8:40 p.m.

During the Summer Session a number of other courses are being offered that may be of interest to librarians in the pharmaceutical field. In the first half of the Summer Session (July 9 to 26) two additional three-week, double-session courses will be given: Scientific and Technical Abstracting and Indexing, taught by T. E. R. Singer, Information Specialist, and Theory and Practice of Documentation, taught by Dr. Mortimer Taube, President of Documentation, Inc. During the six weeks there are also being given courses in science literature, medical literature, and current problems in the technical services.

The fee for each course is $90, in addition to which a small registration fee must be paid. No student is permitted to enroll for more than two courses during the Summer Session. Additional information and applications may be obtained from the School of Library Service, Columbia University, New York 27, N.Y. With the exception of a bachelor's degree and professional experience, there are no academic admission requirements for any of these courses.

We need more pharmacists conducting more pharmaceutical research today if we are to continue to enjoy the advantage of two of the greatest aids in the progress of our profession—prestige and the satisfaction which comes from real contributions to the welfare of the world.

Howard C. Newton, Am. J. Pharm. Ed., 7, 445 (1943)

MEMORIALS

EARL ROY SERLES

Members of the faculty and staff of the University of Illinois College of Pharmacy are deeply sensible that when, on March 13, 1957, death closed the long and distinguished career of Dean Earl Roy Serles, their quitted the scene of American pharmacy one of its well-known figures and the college a powerful leader.

Born at Salem, South Dakota, on November 18, 1890, he was educated first at South Dakota State College, from which he earned a Ph.G. degree in 1911, a B.S. in pharmacy degree in 1915, and a M.S. degree in chemistry in 1917. In 1934 he received the doctorate of philosophy degree in pharmacology from the University of Minnesota. Dean Serles began his career in pharmaceutical education at South Dakota State, where, having held various ranks, he became dean of its division of pharmacy in 1923. His education was interrupted by duty in World War I as a member of the toxicological division of chemical warfare service. In 1940, upon assuming headship of the University of Illinois College of Pharmacy, he began a long association with the University's professional schools, where, as elsewhere, he was zealous in promoting closer relationships between the health professions. Among his services to these schools he provided administrative help and encouragement in instituting a graduate program leading to doctorates of philosophy in pharmacognosy and pharmaceutical chemistry as well as to a master of science degree in pharmacy. He was a member of the executive advisory council to the president of the University and for a time acted as chairman of the administrative committee of the University's Chicago professional colleges. In addition he served upon university, college, and professional school committees too numerous to detail. He was responsible also for conceiving and developing plans for the new building in which the College of Pharmacy is presently housed; many details of its construction and facilities being of his direct suggestion.

Outside his university connection Dean Serles was an active member of many organizations for the promotion of science, of pharmacy, and of the health professions: Sigma Xi; the Illinois Pharmaceutical Association; the South Dakota Medical Association, of which he was an associate member; the American Pharmaceutical Association, of which he was a life member and which he served as president in 1946-1947; the American Association of Colleges of Pharmacy, which also made him president in 1938-1939; the USP Revision Committee (1930-1940).

Educating young men and women, as the record makes clear, was the center and pivot of the crowded career during which so many distinctions came to Dean Serles. It should be noted, however, that his was no narrow view of the profession. In his daily talk he liked to remind colleagues and members of his staff that pharmacy, rightly conceived, as an art with ramifications at once in the intimacies of individual lives and the profundities of science, requires both human understanding and knowledge far beyond the immediate, the limited, the practical.

This vision he shared with all who listened. Of the profession's reputation he was jealous, of its standards he was watchful, for its prestige he was ready to do battle, for the right as he saw it he was a formidable fighter. For the College of Pharmacy of the University of Illinois it was his ambition that it be known as the best in America, that it keep growing, improving, keep not only abreast of the times but, if possible, ahead of them.

R. E. Terry

W. HENRY RIVARD

On February 5, 1957, pharmacists throughout the state of Rhode Island joined in mourning the untimely death of Dean W. Henry Rivard, who died in the Rhode Island Hospital as a result of third-degree burns suffered in an accident in his home on January 18. Dean Rivard is survived by his widow, Margaret (Cook) Rivard; a daughter, Sister Mary Margaret of Jesus, O.P.; four sons, W. Henry, Jr., Charles, John, and George Arthur; and a grandson,

Born in Taunton, Massachusetts, in 1883, William Henry Rivard came to Providence as a child, and after attending public schools there, entered the Rhode Island College of Pharmacy and Allied Sciences. Following his graduation in 1907, he joined the staff of the George L. Claflin Company of Providence, and shortly thereafter became chief chemist in charge of its manufacturing laboratories.

In 1908, still in the service of the Claflin Company, Henry Rivard joined the faculty of the Rhode Island College of Pharmacy and Allied Sciences as a part-time instructor. Continuing his studies in his spare time, he received the Ph.C. degree in 1912; and in 1917 he was honored by his alma mater when he was awarded the honorary degree of doctor of pharmacy.

He soon became a professor of theory and practice of pharmacy; and in 1928 he was simultaneously appointed Chairman of the Department of Pharmacy, Assistant to Dean Edwin Calder, and a member of the Corporation of the college. Upon the death of Dean Calder in 1929, Dr. Rivard was named Acting Dean; and in 1930 he was elevated to the deanship, which position he has held ever since, serving for some time as the oldest dean in the country.

Throughout his lifetime, Dean Rivard's career was punctuated by his many activities in behalf of pharmacy. In 1931, he represented Rhode Island as its official delegate to the United States Pharmacopeia Convention in Washington, D.C., and he has served on a large number of committees of the various pharmaceutical groups.

Besides his pharmacy activities, which included among others, past presidencies of his college's alumni association and of the Rhode Island Pharmaceutical Association, he was a charter member of Beta Epsilon chapter of Kappa Psi fraternity. Dean Rivard was a member of a number of civic organizations, among them the Providence Chamber of Commerce; Providence District Nursing Association; and the Barnard Club, a state-wide educational society. At a dinner in his honor last year, he was made an honorary lifetime member of the Rhode Island Society of Hospital Pharmacists. He was also an honorary member of Rho Pi Phi and Kappa Sigma Kappa fraternities.

For Henry Rivard, president of his class and a cum laude graduate, commencement exercises marked the beginning, rather than the end, of his association

with the Rhode Island College of Pharmacy and Allied Sciences. In fact, as fate has decreed, the association was to last for the remainder of the lifetime of both. For with the impending five year program, the Rhode Island College of Pharmacy, as a means of self-preservation, began to take steps toward outlining a potential program of affiliation with the University of Rhode Island. When this plan was abandoned in favor of one which allowed for the formation of an entirely new college of pharmacy in Rhode Island, within the framework of the state university, the future of the present independent institution was clearly written.

The old idea that "you cannot kill the tree and save the branch" has rung through the years since time immemorial. For Dean Rivard, his college was his life; and his very existence revolved around the day-to-day routine, the schedule of classes, the activities which are so much a part of college life. While the lifetime of this college might be cut short abruptly with a sweep of a pen, even as that of a tree with a mighty blow of the axe, the impact carries on much, much farther. The mere words, ". . . and the Rhode Island College of Pharmacy and Allied Sciences shall cease to exist. . ." were sufficient to bring to an abrupt end fifty-five years of pharmaceutical education. But the man whose life revolved around and was integrated into fifty of those fifty-five years could not conceive of any other way of life.

And so, the two—the man and the College—passed slowly down the corridor of their remaining days together; and who can say that, in his infinite mercy and compassion, Almighty God did not see fit first to cleave swiftly the branch, lest in the ultimate felling of the tree, it be hopelessly shattered.

Now and for all time, in Rhode Island pharmacy, the names "Dean Rivard" and "Rhode Island College of Pharmacy and Allied Sciences" are synonymous. For the Rhode Island College of Pharmacy and Allied Sciences, there will never be another dean—and we are glad, for him, that this is so.

Beverly A. Barton

JOHN WALTER MILLAR

Mr. John Walter Millar, Professor of Chemistry, Emeritus, University of California School of Pharmacy, died following a protracted illness on January 31, 1956. Professor Millar was born in Oakland, California, on December 1, 1878. In 1898 he completed the requirements for the bachelor of science degree in chemistry at the University of California, and in 1899, he was awarded the master of science degree in chemistry. Soon after then he entered the industrial field, first working as a chemist in the explosives industry, then later in the sugar industry.

Professor Millar served as chemist and superintendent of several beet sugar refineries in the western United States and was later sent as superintendent for the construction and operation of cane sugar mills in the Philippines and Indo-China, where he served until World War I. Shortly after the opening of hostilities in World War I, he entered the United States Navy and served as a commissioned officer until the close of the war. After returning to the United States, he enrolled as a student in the California College of Pharmacy and graduated with the class of 1925. At this time, he purchased a small neighborhood pharmacy which he operated for several years and at the same time served as

part-time assistant professor of chemistry in the College of Pharmacy. In 1932 he gave up his retail practice and was appointed professor of chemistry, serving in this capacity until his retirement in 1949. In addition to teaching in chemistry, Professor Millar was interested in the area of pharmacy administration and during the last several years of his service participated in this area of instruction. At the time of his retirement, members of the faculty and friends established the John Walter Millar Award in Pharmacy Administration. The Award, which consists of a plaque on which the name of the recipient is inscribed, is made each year to the student who has demonstrated the highest scholarship in pharmacy administration.

Professor Millar was both a York and Scottish Rite Mason and also a member of the Shrine. He was a member of the Kappa Psi fraternity and was extremely interested in all student activities. He had a pleasing sense of humor and a keen insight to student problems, and his students will always remember him with affection for his interest and guidance and for his ability as a teacher. He was held in great esteem by all who knew him.

He is survived by his widow, Grace L. Millar.

Troy C. Daniels

NEW LITTLE PEOPLE

Barbara Jean Burton—born March 3, 1957, to Mr. and Mrs. Lloyd E. Burton, University of Arizona.

Mary Faith Kokoski—born March 11, 1957, to Dr. and Mrs. Charles J. Kokoski, George Washington University.

Celyna Donna Delgado—born February 20, 1957, to Mr. and Mrs. Jaime N. Delgado, University of Minnesota.

Elizabeth Rodman—born October 17, 1956, to Dr. and Mrs. Morton J. Rodman, Rutgers University.

Jane Alice Frost—born November 10, 1956, to Mr. and Mrs. David Frost, Rutgers University.

Pamela Sue Boblitt—born March 17, 1957, to Dr. and Mrs. R. L. Boblitt, University of Houston.

Lorene Maizy Piantadosi—born January 31, 1957, to Dr. and Mrs. C. Piantadosi, Fordham University.

Gerrysu Guess—born February 21, 1957, to Mr. and Mrs. Wallace Guess, University of Texas.

Nancy Stuart—born March 3, 1957, to Mr. and Mrs. David Stuart, University of Texas.

MARRIAGES

Dean M. McCann, Instructor of Pharmacy Law, University of Southern California, to Miss Carol Geissler, March 23, 1957.

Gust G. Koustenis, Teaching Fellow, George Washington University, to Miss Helen G. Roushakes, January 27, 1957.

STAFF CHANGES

NEW STAFF MEMBERS

University of Southern California. Dr. Wilfred Crowell has been appointed to the staff. He recently obtained his Ph.D. degree from the University of California.

West Virginia University. Dr. Frank D. O'Connell has been appointed assistant professor of pharmacy. He recently received his Ph.D. degree from Purdue University.

University of Washington. Dr. Varro E. Tyler, Jr., has been appointed to the staff as chairman of the department of pharmacognosy, effective the fall quarter. Dr. Tyler recently served in a similar position at the University of Nebraska. He received his B.S. degree from the University of Nebraska and his M.S. and Ph.D. degrees from the University of Connecticut.

Brooklyn College of Pharmacy. Dr. H. I. Silverman has been appointed assistant professor of pharmacy. He received his D.Sc. from Philadelphia College of Pharmacy and Science in 1956. Mr. Kenneth G. Wallace has been appointed instructor of English. He received his M.A. from New York University. Dr. Paul C. Olsen has been appointed chairman of the department of pharmacy administration. Miss Charlotte Alex has been appointed director of public relations. Miss Alex came to the College after association with Tamblyn & Brown as campaign director of fund-raising drives and the Medical Society of the State of New York.

University of Wyoming. Mrs. Ruth D. Ferguson has been appointed emergency instructor of pharmacy for the second semester, 1956-57.

University of Maryland. Mr. Bernard S. Melnicove, a former state senator of Maryland, has been appointed visiting lecturer in pharmacy administration. He has been the attorney for the Baltimore Retail Druggists' Association for five years and is also the attorney for the Maryland Pharmaceutical Association. Mr. James W. Hillis, Jr., of the College of Arts and Sciences is instructor of speech this semester.

CHANGES IN STAFF TITLES

Idaho State College. Dr. Laurence E. Gale has been promoted from Acting Dean to Dean of the College of Pharmacy.

Rhode Island College of Pharmacy and Allied Sciences. Dr. Russell Brillhart has been promoted from Assistant Dean to Acting Dean.

How may we serve best? This is the problem which our Association and each of its member colleges of pharmacy must solve satisfactorily—and soon. On the answer to this question and the execution of this service depends the near-future progress of pharmaceutical education, and consequently, of the profession of pharmacy.

Howard C. Newton, Am. J. Pharm. Ed., 6, 423 (1942)

GENERAL NEWS

Serles passes. Dr. Earl R. Serles, Dean of the College of Pharmacy of the University of Illinois, passed away March 13, 1957, at the age of sixty-six. In recent months, Dean Serles has been in ill health with heart trouble.

Butler receives grant. The College of Pharmacy of Butler University recently received a grant of approximately ten thousand dollars for the development of a radioisotope laboratory.

Rho Chi elects Rowe. Dr. E. J. Rowe of Butler University has been elected the national secretary of Rho Chi Society.

Swanson retires. Dr. Edward E. Swanson, Head of the Eli Lilly and Company Bioassay Department and Lecturer in Biological Assay of Butler University, ended forty years of service when he announced his retirement in January.

Butler hosts deans. Guests for the Rho Chi dinner meeting at Butler University on January 25, were the deans of five colleges of pharmacy; Dean J. B. Sprowls, Dean E. A. Brecht, Dean W. R. Brewer, Dean J. F. McCloskey, and Dean K. L. Kaufman. Dean McCloskey was the after-dinner speaker.

Bobst-Columbia Plan. More than 600 representatives from all areas of pharmacy attended a symposium at the Waldorf-Astoria in New York City on January 31, at which the Bobst-Columbia Plan for Pharmaceutical Education was presented. Mr. Elmer H. Bobst, Chairman of the Board of Warner-Lambert Pharmaceutical Co., Inc., was moderator of the symposium. Among those participating were Mr. Mearl B. Pritchard, member of the New York State Board of Pharmacy, who spoke on the meaning of the plan to retail pharmacy; Dr. W. Arthur Purdum, Chief Pharmacist, The Johns Hopkins Hospital and Professor of Hospital Pharmacy, University of Maryland, who spoke on the recommendations of the plan in relation to his field of hospital pharmacy; Dr. Paul L. Wermer, Vice President and Medical Director of Warner-Chilcott Laboratories, who spoke on the early association of pharmacy and medicine and interprofessional relations; Mr. Robert A. Hardt, Vice President of Hoffmann-LaRoche; Dr. Max Tishler, Vice President and Executive Director, Merck Sharp & Dohme Research Laboratories; and Dr. Melvin Green, Director of Educational Relations of the American Council on Pharmaceutical Education, who discussed the over-all effect of the plan on pharmaceutical education; Dr. Robert L. Swain, Editor of *Drug Topics*, who summarized the talks given at the symposium.

Rhode Island appoints faculty. Dean Heber W. Youngken, Jr., of the newly formed College of Pharmacy of the University of Rhode Island, recently announced four appointments to his staff. These are: Dr. George E. Osborne, of the University of Utah, to be professor of pharmacy and head of the department; Dr. Daniel P-N Tsao, of Oregon State College, to be associate professor of pharmacognosy; Mr. Edward W. Underhill, of the University of Washington, to be instructor in pharmacognosy; and Mr. Henry M. Mason, of Rhode Island College of Pharmacy, to be administrative material assistant in pharmacy. All appointments become effective July 1, 1957.

Nebraska honors Hardt. Alpha Epsilon (University of Nebraska) and Alpha Alpha (Creighton University) chapters of Rho Chi Society sponsored an honor dinner for Mr. Robert A. Hardt, Vice President of Hoffmann-LaRoche and 1922 graduate of the University of Nebraska. Mr. Hardt was initiated in a public ceremony to honorary membership in Rho Chi.

Kansas City offers course in radioactive monitoring. A civilian defense course in radioactive monitoring is being conducted by the pharmacology and physics departments of the University of Kansas City. About forty pharmacy students attend instruction in the use of monitoring equipment for atomic attack.

Berman receives grant. Dr. Alex Berman, Assistant Professor of Pharmacy, University of Michigan, recently was awarded a research grant by the American Society of Hospital Pharmacists from funds provided by Lederle Laboratories. Dr. Berman is working on the subject, "The Development of Printed Hospital Formularies from 1642 to the Present."

Griffith heads drive. Dean Ivor Griffith of the Philadelphia College of Pharmacy and Science has been chosen chairman of a campaign to raise a million-dollar fund to build a school of pharmacy at the Hebrew University of Jerusalem.

Mattocks develops tablet machine innovation. Dr. Albert Mattocks, University of Michigan, with the cooperation of the Colton Company, has developed a tablet compression coating machine which eliminates the possibility of tablets being formed without cores.

West Virginia to have new facilities. The Basic Science Building of the new medical center will be completed soon to house the schools of medicine, dentistry, nursing, and pharmacy. The schools of medicine and dentistry will occupy their quarters for the fall, 1957, semester; whereas, the schools of nursing and pharmacy will move at a later date. Bids for the fourteen-million-dollar teaching hospital unit at West Virginia were opened April 10. This building will require about three years to build and furnish.

PCP honors pharmacists. Philadelphia College of Pharmacy and Science conferred honorary degrees of Master of Pharmacy to C. Elbert Hoffman, Philadelphia, and Harry C. Zeiswig, Milford, Delaware, at the Founders' Day Convocation February 21.

PCP honors Olsen. Philadelphia College of Pharmacy and Science honored Dr. Paul C. Olsen at the Alumni Mid-Winter Reunion Dinner for his thirty-five years of service as a member of the faculty.

Folkers speaks at PCP. Dr. Karl F. Folkers, discoverer of Vitamin B_{12} and Executive Director of Fundamental Research at Merck Sharp & Dohme, received the Philadelphia College of Pharmacy Rho Chi Citation and delivered the Julius W. Sturmer Memorial Lecture.

Bradt retires. Frederick T. Bradt, Assistant Professor of Biological Sciences, Wayne State University, retired February 1, 1957, after forty-one years of service to the college. The Wayne State University College of Pharmacy Alumni Association sponsored a dinner in his honor March 20, at the Whittier Hotel, Detroit.

Sciuchetti completes Ph.D. program. Professor Leo A. Sciuchetti of Oregon State College recently completed his studies at the University of Washington for the Ph.D. degree in pharmacognosy.

Thayer receives honor. Dr. James R. Thayer of St. Louis College of Pharmacy and Allied Sciences was one of six men honored by the college's alumni association for outstanding service to pharmacy in the St. Louis area for 1956.

Memorial lectures at Temple. In cooperation with the Pharmacy Alumni Association of Temple University, the School of Pharmacy presented on April 10, four lectures honoring former deans of the School of Pharmacy. The W. Wallace Fritz Memorial Lecture was given by Dr. O. Spurgeon English, Professor and Head of the Department of Psychiatry at Temple University Medical Center. The I. Newton Snively Memorial Lecture was given by Dr. Thomas G. Allin, Research Associate of the William S. Merrell Co. The H. Evert Kendig Memorial Lecture was presented by Dr. Stuart Sessoms, Assistant Director of the Clinical Center of the National Institutes of Health. The John R. Minehart Lecture was given by Dr. David E. Mann, Jr., Associate Professor of Pharmacology, Temple University. On the same day, the School dedicated its H. Evert Kendig Memorial Museum.

North Carolina foundation supports research. A report of the North Carolina Pharmaceutical Research Foundation indicates that during the past ten years the Foundation has been in existence, it has had an income of $211,500. Of this sum $64,000 has been spent, leaving a total of $145,000. Of this amount $122,500 is in endowment funds and $23,000 is in expendable funds. The 1957-58 budget calls for expenditures of $10,800.

Schaefer honored. Over 600 pharmacists and representatives of pharmaceutical firms and organizations recently attended a testimonial dinner honoring Dr. Hugo H. Schaefer, marking his retirement as Dean of Long Island University's Brooklyn College of Pharmacy after two decades of service. Members of the pharmaceutical profession honoring Dr. Schaefer at the dinner paid permanent tribute to him by establishing the Hugo H. Schaefer Endowment Fund to be used to expand the research program, services and facilities at the Brooklyn College of Pharmacy, to build a radioisotope laboratory, and to advance pharmaceutical education in general at the College. The Alumni Association of the College presented Dean Arthur G. Zupko with a check for $2,500 to be used in building the new radioisotope laboratory.

Rivard passes. Dr. W. Henry Rivard, Dean of the Rhode Island College of Pharmacy and Allied Sciences, died February 5, 1957, at the age of seventy-three as a result of burns received from ignited cleaning fluid.

AAAS Pharmacy Section officers. Dr. Robert C. Anderson, Eli Lilly and Company, was elected by the AAAS Council as Vice President of the AAAS and Chairman of the Pharmacy Section for the year 1957. The Secretary of the Section is Dr. John E. Christian, Purdue University.

Colorado's Pharmacy Airborne. Dean Curtis H. Waldon and Dr. Roy E. Jones represented the University of Colorado on the annual airborne tour sponsored by the Colorado Pharmacal Association at three district meetings.

Pharmacy enrollment. The Report of Enrollment in Schools and Colleges of Pharmacy was released by the AACP on December 14, 1956. This Report revealed a gain of 1.6 per cent in enrollment in all the colleges of pharmacy in the continental United States. The total undergraduate enrollment figure for the fall of 1956 represented the highest total enrollment

in all United States colleges of pharmacy since the fall of 1951. However, since submitting this report, the Association has received information from two new colleges of pharmacy; namely, the College of the Pacific, Stockton, California; and Northeast Louisiana State College, Monroe, Louisiana, showing enrollments of eighty-two at the College of the Pacific and sixty-seven at Northeast Louisiana State College. Inclusion of the reports of these two colleges changes the total enrollment of all colleges of pharmacy in the continental United States to 17,076 and represents a 2.5 per cent increase over 1955.

Pharmacy Section, AAAS meeting. The Pharmacy Section (Np) of the AAAS held seven sessions December 26, through December 29, at New York City. A total of seventeen contributed papers on original studies were reported; two symposia and two panel discussions were held. Over 800 persons registered as having attended one or more of the Pharmacy Section meetings.

Of considerable interest, as shown by the attendance in excess of 450, was the symposium and discussion on cosmetics, which attracted interest outside the pharmaceutical group in attendance. This session was co-sponsored by the Committee on Cosmetics of the American Medical Association. Various aspects of cosmetic utilization were discussed by six experts in the field. Veronica Conley discussed the new role of cosmetics in everyday living, and Dr. Paul G. I. Lauffer discussed the scientific formulation of cosmetics. The essentials of skin cleansing were brought out by R. S. Suskind, and a paper on the control of auxiliary sweating and body odors was presented by Dr. Sulzberger and Dr. Hermann. The present status of pigment-forming drugs was covered from the standpoint of chemical structure and activity by Dr. A. B. Lerner. Some of the toxicity problems encountered in the use of cosmetics were called to the attention of the group by B. E. Conley. A very interesting and lively discussion of the various cosmetic problems followed with Dr. I. H. Blank, Dr. S. Rothman, Dr. C. Nelson, and Dr. H. T. Behrman participating.

Over 150 interested pharmaceutical scientists attended a four-hour panel discussion on the problems of compressed tablet coatings. Dr. P. Wilcox discussed the history of tablet coatings and some of the general problems involved. He was followed by four speakers who had had first-hand experience with the operation of different coating machines. Each speaker summarized the operation, advantages and disadvantages of a particular machine, and followed this with a film showing the precise operation. The following persons participated: Dr. J. Cooper, Dr. V. H. Hostetler, Dr. W. Madison, and Dr. A. Mattocks.

The Pharmacy Section also co-sponsored a symposium on antienzymes with the chemistry, dentistry, and medical sciences sections participating. Of particular interest to the pharmaceutical scientists in attendance was the discussion of insulinase inhibitors by Dr. Arthur Mirsky.

Dr. R. H. Blythe, Director of Pharmaceutical Research for Smith, Kline, and French Laboratories and Chairman of the Section, opened the contributed papers sessions with a stimulating discussion of the importance of the Pharmacy Section in the AAAS. He clearly pointed out the importance of a common meeting ground for the various scientific disciplines. The scientific papers presented were of unusual merit. Dr. L. Chavkin, Columbia University, reported on tablet coatings designed for timed disintegration. A study of the stability of sulfadiazine sodium injection, as done at Temple University, was discussed by Dr. J. Autian. Stabilized peroxides were discussed by Dr. H. M. Cobe, also of Temple. Dr. M. J. Rodman presented the interesting convulsant and analeptic actions of anisatin. Dr. J. E. Christian, Purdue University, discussed the polarography of adrenergic blocking agents and nitrogen mustards. Dr. K. J. Master and Dr. G. L. Jenkins reported their work of the hemoglobin regeneration of iron compounds. Human blood and urine concentrations following administrations of sulfaethylthiadiazole were discussed by Dr. J. V. Swintosky of the Smith, Kline, and French Laboratories.

The hospital pharmacy group had a very interesting, well-attended, and spirited full-day session, under the direction of Dr. G. F. Archambault of the Public Health Service. A number of important subjects were presented including the law-imposed responsibilities on the hospital pharmacist, a professional degree for hospital pharmacists, cost data of injectables, scientific management of drug and pharmaceutical resources, narcotic-hypnotic control systems, the use of investigational drugs in hospitals, and several others. A panel discussion of the papers followed with the below-named participants: Paul Parker, Newell Stewart, Fred Lascoff, R. Zimmerman, Joseph Oddis, Robert Bogash, Herbert Flack, and E. E. Leuallen. Luncheon, entertainment, and dinner were sponsored by Squibb, Wyeth, and Pfizer, respectively.

Degrees to Brooklyn staff. Doctorate degrees were conferred on Edward Stempel and Jack Sosinsky of Brooklyn College of Pharmacy by Columbia University and New York University, respectively. Mr. George V. Sherry was awarded the M.A. degree by New York University.

Faculty members honored. Professor Berl S. Alstodt, Brooklyn College of Pharmacy, and Professor Samuel S. Liberman

of Columbia University were honored February 3, at a dinner given by the Retail Druggists Division of the Federation of Jewish Philanthropies.

Johnson continues study. Mr. William E. Johnson, Assistant Professor of Pharmacy at the University of Wyoming, is on leave of absence from his duties the second semester of the current year while completing his residence requirements for the Ph.D. degree at the State College of Washington.

Beal and Cava receive grant. Dr. Jack L. Beal and Dr. Michael Cava of Ohio State University recently received a $2,000 grant from the Ohio State Development Fund to investigate Ohio plants for constituents of medicinal interest.

TV series sponsored by Ohio State. Dr. Rupert Salisbury of Ohio State University has been coordinator of a twelve-week public relations series entitled "Focus on Your Pharmacist," which appeared once a week on television. The following topics were used for discussion by local registered pharmacists: "The Pharmacist and the Prescription," "The Development of Pharmacy in the Twentieth Century," the film *Time for Tomorrow*, "The Low Cost of Prescriptions," "The Development of a Drug," "The Marketing of a Drug," "The Medicine Chest," "Vitamins," "Women in Pharmacy," "Medicinal Plants of the Flower Garden," "The Ethics of Pharmacy," "Opportunities in Pharmacy."

Korean official visits Maryland. Mr. Kyung Mo Chung, Chief of the Bureau of Pharmaceutical Affairs, Ministry of Health and Social Affairs of the Republic of Korea, visited the University of Maryland School of Pharmacy recently.

Albany College of Pharmacy builds addition. The Diamond Jubilee Wing of Albany College of Pharmacy, which will add 12,500 square feet of space to the existing building, will be ready for use in September. Included in the new wing are two modern laboratories (one for physical chemistry). A large lecture room capable of seating 121 students and a new cafeteria are also provided, as well as several new offices and auxiliary rooms. The cost of the building and equipment, amounting to approximately $325,000, has been largely borne by contributions from alumni and friends.

Wilson to write history. Dean Emeritus Robert C. Wilson of the University of Georgia, with the aid of funds of the University of Georgia Foundation, plans to write a book on the history of pharmacy in Georgia. He will be assisted by members of the faculty of the University of Georgia School of Pharmacy as well as wholesale, retail, and manufacturing pharmacy personnel of the state.

Gilson named president. Dr. Charles F. Gilson, formerly Vice President of the Rhode Island College of Pharmacy and Allied Sciences, has been appointed President, replacing Dr. Albert W. Claflin who passed away last June.

Davis passes. Dr. Julius M. Davis, member of the Board of Trustees of Rhode Island College of Pharmacy and Allied Sciences, died in January following a long illness.

RICP to close doors. Rhode Island College of Pharmacy and Allied Sciences will terminate its charter and activities on June 30, 1957, completing fifty-five years of service as a private institution of pharmaceutical education. The University of Rhode Island College of Pharmacy will begin its course of instruction in September, 1957.

Industry support to education. The ethical pharmaceutical industry contributes approximately $10,000,000 annually to medical and related schools in this country, it was revealed by Health News Institute recently in commenting on an industry-wide survey.

The survey was conducted by the American Drug Manufacturers' Association at the request of the Committee on Interstate and Foreign Commerce of the House of Representatives.

The $10,000,000 figure representing financial support of medical schools, the ADMA said, was "only a small proportion of the total research effort of this industry—considerably less than 10 per cent of the complete outlay for research."

Member firms of the association, responsible for some 90 per cent of the total business carried out by the membership, replied to the survey. Returns showed that about 25 per cent of the $10,000,000 is given in the form of general contributions, while 75 per cent is contributed in connection with specific research grants.

Of the 25 per cent donated to medical and other schools, there are no strings attached. "However, the entire amount," the ADMA said, "whether connected with specific research projects or not, may be considered applicable to the over-all operating budgets of the various educational institutions, and helps support them."

The manufacturers are increasing financial incentives to promising scientific students at the high school level and expanding their contributions to selected colleges and universities. Practically every firm in the industry has taken some positive action designed to increase student interest or promote on-the-job training of scientists. Some companies encourage further scientific study of their laboratory personnel by defraying some of the costs of continuing study.

The pharmaceutical industry supports more than 700 students in the medical and allied sciences through scholarships or fellowships, the Health News Institute said. "The industry covers the expenses of

about one student in the medical and allied sciences for every five such graduates employed," the ADMA report to the House Committee said. "This demonstrates that industry management recognizes the urgent need for training adequate numbers of doctors and scientists, and is taking constructive steps along that line.

"According to recent studies of the National Science Foundation, the drug industry spends a larger proportion of its sales dollar upon research than any other industry of comparable size. These large expenditures are made because the industry lives on medical research; to the normal business reasons must be added the humanitarian reasons for making all possible efforts to improve health and save life."

AFPE meeting. Howard B. Fonda, Senior Vice President, Burroughs Wellcome & Co. (U.S.A.), Inc., was elected President of the American Foundation for Pharmaceutical Education at the Fifteenth Annual Meeting of the Foundation held March 7 at The University Club, New York, New York. Francis C. Brown, President, Schering Corporation, was re-elected Vice President. John J. Toohy, General Manager, E. R. Squibb & Sons, Division of Olin Mathieson Chemical Corporation, was elected Treasurer. James F. Hoge, Rogers, Hoge & Hills, was re-elected Counsel, and W. Paul Briggs was re-elected Secretary and Executive Director. L. D. Barney, President, Hoffmann-La-Roche, Inc., was elected Chairman of the Finance Committee.

L. D. Barney, President, Hoffmann-La-Roche, Inc.; Edgar S. Bellis, Bellis Pharmacy; Francis C. Brown, President, Schering Corporation; J. Mark Hiebert, President, Sterling Drug, Inc.; W. Rutherford James, President, Towns & James, Inc.; Harry J. Loynd, President, Parke, Davis & Company; and Robert L. Swain, Editor, Topics Publishing Company, were re-elected Directors. Lyman C. Duncan, General Manager, Lederle Laboratories Division, American Cyanamid Company; E. Gifford Upjohn, President, The Upjohn Company; and Thomas J. Winn, Vice President and General Manager, Chas. Pfizer & Co., Inc., were newly elected to Directorships.

Charles J. Lynn, Vice President, Eli Lilly and Company, was re-elected a member of the Board of Grants. Other members of the Board of Grants are: Chairman, Dr. Ernest Little, Dean Emeritus, Rutgers University; Dr. A. J. Brumbaugh, former President, Shimer College; Dr. Daniel Z. Gibson, President, Washington College; and Robert Lincoln McNeil, Founder, McNeil Laboratories, Inc.

L. D. Barney, President, Hoffmann-La-Roche, Inc.; Charles S. Beardsley, Chairman of the Board, Miles Laboratories, Inc.; Richard A. Deno, Professor, University of Michigan; Charles D. Doerr, Vice President, McKesson & Robbins, Inc.; H. A. B. Dunning, Chairman of the Board, Hynson, Westcott and Dunning, Inc.; Harry J. Loynd, President, Parke, Davis & Company; Hugo H. Schaefer, Dean Emeritus, Brooklyn College of Pharmacy; Robert L. Swain, Editor, Topics Publishing Company; and Charles R. Walgreen, Jr., President, Walgreen Drug Stores, were elected to the Executive Committee, serving with the Officers of the Foundation.

George V. Doerr, former Vice President of McKesson & Robbins, Inc., is Honorary President of the Foundation.

The Board solemnized the passing of its sixth President, James J. Kerrigan, who died in office, September 5, 1956, and inscribed a Memorial Resolution to him in its permanent records.

A budget of $229,800 was approved by the Board of Directors in support of the educational projects of the Foundation for 1957-58.

The Foundation has aided 1,359 undergraduate students in colleges of pharmacy. During the last academic year, the Foundation provided undergraduate scholarship awards in forty-nine colleges for 158 pharmacy students.

It has supported the Ph.D. studies of 370 graduate students in pharmacy and related scientific fields, and is currently maintaining seventy-seven graduate Fellowships in twenty-nine universities. One hundred and seventy-six Foundation Fellows are now teaching in seventy-two colleges, and seventy-nine Fellows are engaged in research and development work with forty-eight manufacturing chemical and pharmaceutical firms.

The Foundation is continuing its financial support to the American Association of Colleges of Pharmacy Student Recruitment Program.

The Foundation also supports The American Council on Pharmaceutical Education, annual Teachers' Seminars, and *The American Journal of Pharmaceutical Education.*

It administers the E. L. Newcomb Memorial Awards; the S. B. Penick, E. Mead Johnson, Charles R. Walgreen, and H. A. B. Dunning Memorial Fellowships; and the Gustavus A. Pfeiffer Postdoctoral Memorial Research Fellowships.

The Foundation is supported by nearly 200 of the leading firms of the drug trade, manufacturing and related industries.

The Association Members of the Foundation are: American Association of Colleges of Pharmacy, American Drug Manufacturers Association, American Pharmaceutical Association, American Pharmaceutical Manufacturers' Association, Federal Wholesale Druggists' Association, National Association of Boards of Pharmacy, National Association of Chain Drug Stores, National Association of Retail Druggists,

National Wholesale Druggists' Association, The Proprietary Association.

Directors of the Foundation are: L. D. Barney, President, Hoffmann-LaRoche, Inc.; Charles S. Beardsley, Chairman of the Board, Miles Laboratories, Inc.; Edgar S. Bellis of Bellis Pharmacy; John G. Bill, President, Merck Sharpe & Dohme, Division of Merck & Co., Inc.; Elmer H. Bobst, Chairman of the Board, Warner-Lambert Pharmaceutical Co.; Francis C. Brown, President, Schering Corporation; Alvin G. Brush, Chairman of the Board, American Home Products Corporation; George B. Burrus, President, Peoples Drug Stores, Inc.; John A. Crozier, General Manager, Calvert Drug Company; Richard A. Deno, Professor, University of Michigan; F. S. Dickinson, Jr., President, Becton, Dickinson & Company; Charles D. Doerr, Vice President, McKesson & Robbins, Inc.; Lyman C. Duncan, General Manager, Lederle Laboratories Division, American Cyanamid Company; H. A. B. Dunning, Chairman of the Board, Hynson, Westcott and Dunning, Inc.; Howard B. Fonda, Senior Vice President, Burroughs Wellcome & Co. (U.S.A.), Inc.; J. Mark Hiebert, President, Sterling Drug, Inc.; W. Rutherford James, President, Towns & James, Inc.; J. Preston Levis, Chairman of the Board, Owens-Illinois Glass Company; Eli Lilly, Chairman of the Board, Eli Lilly and Company; Harry J. Loynd, President, Parke, Davis & Company; O. J. May, Member of the Board, Smith, Kline & French Laboratories; Smith Richardson, Jr., Vice President, Vick Chemical Company; Hugo H. Schaefer, Dean Emeritus, Brooklyn College of Pharmacy; John G. Searle, President, G. D. Searle & Co.; George F. Smith, President, Johnson & Johnson; Robert L. Swain, Editor, Topics Publishing Company; Linwood F. Tice, Associate Dean, Philadelphia College of Pharmacy and Science; John J. Toohy, General Manager, E. R. Squibb & Sons, Division of Olin Mathieson Chemical Corporation; E. Gifford Upjohn, President, The Upjohn Company; Ernest H. Volwiler, President, Abbott Laboratories; Charles R. Walgreen, Jr., President, Walgreen Drug Stores; Edward T. T. Williams, Chairman of the Executive Committee, Warner-Lambert Pharmaceutical Co.; Thomas J. Winn, Vice President and General Manager, Chas. Pfizer & Co., Inc.; Louis C. Zopf, Dean, State University of Iowa; George L. Webster, Professor, University of Illinois.

A flexible, uncrowded curriculum is needed to permit students to lay the ground work for future specialization, to permit progressive schools to incorporate new subjects into plans of study, and to permit some liberty within which each school may need to develop the intellectual powers of its students.

Glenn L. Jenkins, Am. J. Pharm. Ed., 8, 648 (1944)

BOOK REVIEWS

Traité de Pharmacie Chimique, P. Lebeau and M.-M. Janot, Editors, in collaboration with M. Guillot, G. Valette, Y. Raoul, A. Morette, M. Chaigneau, P. Corriez. Fourth Edition in 5 volumes. Masson et Cie, Paris, 1955-56. xxv + 4140 pages. 37,000 francs.

This handsome new edition of the well-known French treatise by members of the Faculty of Pharmacy of Paris, like its predecessors offers encyclopedic coverage of the chemistry of drugs and other compounds used in pharmacy and medicine. The authors have followed the sequence of previous editions devoting Volume I to inorganic compounds including extensive discussions of radioisotopes in medicine; Volume II to non-nitrogenous organic compounds; Volume III to organic nitrogen compounds, alicyclic hydrocarbons, terpenes, steroids, vitamins, hormones, and organo-metallic compounds; Volume IV to heterocyclics, artificial coloring materials, antihistaminics and alkaloids; Volume V to glycosides, proteins, antibiotics, and miscellaneous substances. Volume I contains its own index. A comprehensive 164-page index to the organic section (Vols. II-V) is found in Volume V. A table of contents is provided at the end of each volume.

As this treatise has been written by pharmacy faculty members, it is characterized by a pharmaceutical approach this reviewer finds rewarding. At the beginning of the first volume a list is given of the world's pharmacopeias, and every drug monograph in this work indicates all pharmacopeias in which the drug is official. In addition synonyms, trade-names, and manufacturers are given. These include American as well as other foreign drugs. Structural formulas, syntheses, or modes of preparation are described throughout, often in great detail. Chemical properties, tests for identity, and methods of assay are also presented. Therapeutic and pharmaceutical uses of drugs and drug groups are discussed, although this work does not exhaustively extract the pharmacological literature.

As reference books, this treatise should find space on the library shelves of all institutions where pharmaceutical research or teaching is in progress. Every page is heavily documented with references to the world's literature so that there must be well over 20,000 citations. Volume I covers literature through 1951 only. In others references as late as 1955 occur. Addenda in Volume V contain additions, some too late to have been included in the text. Perhaps one cannot demand that such a mass of literature citations be free of errors, but occasional misspelling of author's names or initials, or inaccuracies in page references, might have been detected by more adequate proofreading of this fine print. Occasional inaccurate page references or omissions have also been noted in the index (cf. DFP).

In spite of these shortcomings, the reviewer feels that here is a valuable series which can be of great use to the teacher and student in any of the pharmaceutical sciences. There is nothing parochial about this work. American literature is as frequently cited as the foreign. Liberal reference to European doctoral theses gives a valuable insight into graduate work abroad.

Introductory material to such sections as the alkaloids, glycosides, and other drug groups provide stimulating reading. More data on the extraction of drugs of natural origin, such as digitalis, glycosides, curares, and cocaine are furnished here than in any other text known to this reviewer. It is unfortunate that the language barrier will prevent most of our undergraduate students from using "Lebeau" as a standard reference.

Theodore O. King
University of Wyoming

Biochemical Individuality, Roger A. Williams. John Wiley and Sons, Inc., New York, New York, 1956. xiii + 214 pp. 17 figs., 16 tbls. $5.75.

In this massively documented and brilliantly reasoned book, Dr. Williams, President of the American Chemical Society for 1957, sets forth his view that every individual organism possesses unique, genetically determined body chemistry and quantitatively distinctive nutritional needs. The pioneer in the microbiological approach to the study of vitamins then argues for further research in the field of biochemical variability. Such studies, he claims, have enormous practical applications in biology, medicine, dentistry, and psychiatry.

The author marshals an impressive array of facts to support his view that variability is vastly more important than is currently assumed by most investigators, who are concerned mainly with establishing "normal" values and formulating all-encompassing generalizations. It may

seem to some, however, that the author sometimes belabors the obvious in his zeal to make his point. Certainly, the pharmacologist, dealing daily with the bugbear of biological variations in closely inbred animals of the same sex, age, and weight, needs little convincing of the fact that their variations in response to drugs depend largely on biochemical differences existing in the individual animals. But the pharmacologist who reads Dr. Williams' chapter on the pharmacological manifestations of biochemical individuality with the hope of gaining new insights into this perennial problem is doomed to disappointment. For while examples are listed, from the pharmacological literature, of a dozen different drugs to which animals vary widely in their responses, the experimental results are in no case interpreted in terms of any specific biochemical difference known to exist among individuals within a species. This is not the fault of the author, who bemoans the failure of pharmacologists to collect any substantial amount of data directly pertinent to such interpretation.

The most stimulating aspect of the book is the author's wide ranging conception of how individual distinctiveness in chemical composition, enzyme and endocrine activity, and excretion patterns could be systematically studied and the results applied to practical problems in physical and mental disease.

Dr. Williams bases his ideas in this regard upon his "genetotrophic" principle: that every individual has a distinctive genetic background and quantitatively distinctive nutritional needs that must be met for optimal well being. He then extends this principle to conclude that practically any disease, deformity, or human weakness could be overcome, provided that the person's unusually high nutritional needs for specific substances can be discovered and the needed nutrients supplied.

Many will, of course, disagree with the author's notion that nutrition alone could alter all genetic defects to some extent, and even he is forced to admit that the practical problems of supplying the needed environmental factors are far from simple. Yet one does not have to accept his assumption that individually tailored nutrition has potentially tremendous implications for human welfare to be thrilled by the breadth of his knowledge and vision.

The many provocative ideas set forth in this book, such as the author's interpretation of his own well-known work on the efficacy of dietary supplementation in diminishing alcohol consumption in the rat, make it merit a place in the library of everyone engaged in research in any aspect of the biological sciences.

Morton J. Rodman
Rutgers University

The Encyclopedia of Chemistry, George L. Clark, Editor-in-Chief; Gessner G. Hawley, Managing Editor; and William A. Hamor, Advisory Editor. Reinhold Publishing Corporation, New York, New York, 1957. xvi + 1037 pp., 52 figs., 160 tbls., illus. $19.50.

The editors of this book have accumulated between its covers an amazing volume of significant and carefully written material prepared by 544 contributing authors who are broadly representative of scientific personnel in education, industry, and government. The topic discussions are clear and concise, the type is readable and almost entirely free of errors, and the paper is of very good quality. The topic headings are arranged in alphabetical order on 6¾ by 10-inch double-columned pages and may be located easily by reference to the extreme outside margin at the top of each page. All articles and related materials are listed in a double-columned, thirty-page index in the back of the book also. In spite of its extensive scope, the book is manageable, and it is handsomely and strongly bound.

Each of the articles presents a surprisingly complete discussion of the subject matter. An even more complete picture of the subject may be obtained by reading other articles suggested in the cross references found within the body or at the conclusion of the original discussion. Some examples of the topics covered in these discussions are: adsorption, amino acids, blood, carbohydrates, carcinogenic substances, catalysis, chelation, chemical dating, chemical literature, chemical nomenclature, colloid chemistry, cytochemistry, dialysis, dissociation, electrochemistry, electrolysis, electron miscroscopy, electrophoresis, entropy, fats, fibers (natural and synthetic), nuclear fission, foods, fungicides, gals laws, genes, Grignard reactions, hydrocarbons, hydrogenation, industrial chemistry, infrared spectrometry, inorganic chemistry, ion exchange, kinetics, mass spectrometry, metals, microchemistry, noxious gases, nucleonics, nutrition, organic chemistry, organometallic compounds, periodic law, pesticides, petroleum, photochemistry, physical chemistry, phytochemistry, plastics, polarization, polymerization, proteins, reaction rates and types, solubility and solutions, solvent extractions, solvents, stereochemistry, steric hindrance, structural antagonism, surfactants, thermochemistry, toxicity, transuranium elements, Van der Waals forces, viruses, vitamins, waxes, and X-rays. Figures, illustrations, and tables are included in many of the discussions to provide the reader with additional significant information. Articles of interest dealing with the structures, responsibilities, and activities of many scientific institutions and societies, and biographies of men and women

prominent in the history of chemistry and related sciences are given rather complete treatment also.

Although many different types and classes of inorganic and organic compounds are described and discussed under various headings, the book is not a completely adequate source of information concerning the physical and chemical properties of specific compounds. Neither is it a complete source of information on synthetic methods of particular interest to the organic chemist.

It is the opinion of the reviewer that this book should be given a conspicuous place in the educational, industrial, and even the home library. Although it would have limited use as a reference work for specific courses in the pharmacy curriculum, it is one that will be extremely helpful to the student seeking fundamental knowledge in the vast, complex, and diversified field of chemistry. It is not, nor was it designed to be, a full and complete reference which will be useful to the student seeking a compilation of cold chemical facts, definitions, and data.

Charles F. Martin
State College of Washington

Merchandise Control in the Retail Pharmacy, Richard J. Hampton. Economic and Business Studies, Bulletin No. 30, January 1957. State College of Washington, Pullman, 1957. viii + 96 pp., 1 fig., tbls. $1.50.

The purpose of this study, originally written as a master's thesis, is to compile certain information concerning merchandise control in the retail pharmacy. Some of the more important items studied were: (1) The types of control systems in use in retail and hospital pharmacies in the state of Washington, (2) The factors that seem to influence the quality of control in the retail pharmacy, (3) The factors that seem to influence satisfaction on the part of the retailer concerning his control practices, (4) The types of outside help available to the retail pharmacist in merchandise control, and (5) A control system considered to be satisfactory for use in practically all retail and hospital pharmacies. The author concludes that the "study indicates that the merchandise control practices among retail pharmacists in the state of Washington are at present not particularly systematic, nor are they generally of a type that can be considered satisfactory. There is some reason to believe than an appreciable number of pharmacies are aware of the problem and are interested in improving the quality of their control procedures if an adequate system is presented to them."

The author reviews the various methods of merchandise control, principally those recommended for use in department stores; reports on a mail questionnaire survey which tried to elicit the factors enumerated above; and, finally, suggests the periodic inventory method as the one having the least objections. Except for the very large retail pharmacy units with adequate personnel, it seems to me that the recommended procedures involve entirely too much clerical work and detail. The average pharmacist is concerned about merchandise control, but he wants a simple system entailing a minimum of clerical detail. The author might have considered the purchase budget in conjunction with the average purchase rule. This is a system based upon dollar values of purchases on an over-all basis using a particular turnover ratio as an objective basis for controlling purchases and open-to-buy quotas. Periodic visual checks as well as an annual physical inventory can be used to make adjustments as needed. The author, incidentally, does not supply an objective standard to evaluate the various control methods.

The report is a fairly good review of merchandise control methods and the usual research procedures as well as reporting and, as such, has a place in a pharmacy college library. One final note: With the great advances made in sampling and other statistical procedures why is so much pharmaceutical business conducted using methods that have been abandoned by other business researchers over ten years ago?

Isidore Greenberg
Brooklyn College of Pharmacy

Clinical Chemistry: Principles and Procedures, Joseph S. Annino. Little, Brown and Co., Boston, Massachusetts, 1956. xxii + 280 pp., 11 tbls., 2 charts. $7.50.

The author has recognized a growing need for a book containing concise yet comprehensive information to help the average student or worker in the clinical chemical laboratory.

The first seventy-three pages are devoted to a discussion of fundamental principles and techniques designed to overcome the gross inadequacies in background often found among technicians and students. In these first four chapters such subjects as laboratory apparatus, solution preparation, colorimetry, and handling of specimens are discussed from the standpoint of problems peculiar to those encountered in the clinical laboratory. Here the author shows himself to be familiar with the problems of training technicians and shows admirable restraint in omitting more advanced material not likely to be assimilable by those who require the presentation of this basic material at all.

Part Two consists of fourteen chapters each dealing with a chemical test or a group of tests related either from an analytical or interpretive point of view. For example, enzymes are considered in

one chapter as are calcium and phosphorous in another.

A typical presentation of a single analytical problem consists of an introduction in which the principles of various methods are briefly described with references to the literature. A recommended procedure is described in detail, including its standardization and a method of calculating results. There follows a discussion of limitations and pitfalls in the procedure and a brief presentation of the simple interpretation and significance of results.

About thirty procedures are recommended, representing a good coverage of the most commonly performed tests. The recommended procedures selected are, in general, excellent choices.

The reviewer feels that this book achieves the expressed intent of the author very well, that is "to help fill the gap between 'cook books' of methods and those which include methods but emphasize the physiological significance . . . of results." The group to which this book will be of the most help will include students with minimum chemical training (1½-2 years of college chemistry) and technicians who do not specialize in clinical chemistry but who are called upon to perform and even supervise work in this field.

Particularly good sections are those on nitrogen, in which a variety of acceptable techniques are described and evaluated, and the simple yet illuminating discussion of flame photometry. The section on pipette calibration prescribes more rigorous tolerances than most laboratories, including that of the reviewer, feel necessary. Certain tests such as colloidal gold might well be omitted to make room for, say, 17-keto steroids. However, all in all the author has trod the middle ground consistently and usefully.

Nelson F. Young
Medical College of Virginia

Spot Tests in Organic Analysis, Fritz Feigl (translated by Ralph Oesper). Fifth Edition. Published by Elsevier Publishing Company, New York, and distributed in the U.S.A. by D. Van Nostrand Company, New York 10, New York, 1956. xx + 616 pp., 32 figs., 41 tbls. $10.00.

This new edition is an outgrowth of the previous edition of *Spot Tests, Volume II, Organic Applications,* which included slightly over 435 pages devoted to organic spot test analysis.

As in the previous edition the use of spot tests in qualitative organic analysis is given in chapters three through six. The order of the divisions has not been changed. They are preliminary tests, detection of functional groups, detection of individual compounds, and applications for technical purposes.

The first chapter, dealing with the past, present, and future prospects of spot test analysis, has been enlarged to include a more intensive treatment of the basic philosophy of the analytical uses of organic reactions. The material describing the techniques of spot testing has not been changed. The chapter on preliminary tests now contains sixty-two tests as compared with the previous forty-four tests. New tests for functional groups and individual compounds have expanded the respective chapters from 114 covering 96 pages to 169 covering 125 pages. The number of examples of the application of spot tests to technical purposes has been raised from thirty-six to sixty-two. A new feature in this chapter concerns the inclusion of additional tests for the indentification of medicinals by means of spot tests. An additional chapter in the new edition provides a list of references to papers dealing with the use of spot tests in qualitative organic analysis that have not been referred to in other parts of the book. The tabular summary of the limits of identification attained by spot tests has been enlarged to include data on the new tests.

The new edition continues the policy of stressing the underlying chemical reactions where possible, giving many structural formulas, and including the pertinent data regarding sensitivity and reliability for most of the tests. Many new references to the original literature are found at the end of each chapter. Both author and subject indexes seem quite adequate.

Ralph Oesper, who is the translator of this and previous editions of Feigl's books, has again done a fine job in making *Spot Tests in Organic Analysis* available in clear and concise English.

The reviewer feels that one of the advantages in the use of this volume is that each test is complete in itself and it is not necessary to look elsewhere for pertinent information. The book will be a useful source of information for pharmaceutical chemists, organic chemists, analytical chemists, and biologists. Graduate students in the above fields will find the book to be a valuable reference. The author believes that spot tests are adequate to meet certain requirements for the various pharmacopeias and should be considered by those in charge of these important publications. It is felt the resulting economies in time, labor, and material will prove advantageous.

Wm. H. Coppock
Drake University

Hypotensive Drugs, M. Harington, Editor. Pergamon Press, New York, New York, 1956. x + 222 pp., 71 figs., 9 tbls. $8.00.

The Pergamon Press, presumably named for Galen's birthplace, appears to specialize in the publication of symposia. The symposium in this instance was held in London and the speakers included most

of the leading British authorities in the field of hypotension, with a sprinkling of distinguished visitors from overseas.

This volume consists of papers presented and discussions that took place at the four sessions of the symposium. The proceedings of the first session, devoted to the chemical and biochemical aspects of hypotensive drugs, are highlighted by an exceptionally good discussion of structure-action relationships of amidines, rauwolfia alkaloids, and the ganglion-blocking onium salts by a pioneer in the field, H. R. Ing. Other papers from this session include one on biochemical principles of hypotensive drug action and one on a series of diquaternary-aminobenzhydryl compounds which appear to be powerful ganglionic blockers. This discussion is mainly centered on the effect of the anion on the actions of bisquaternary cations.

The second session includes excellent papers dealing with the pharmacology of hydralazine, reserpine, the B-haloalkylamines, and the veratrum alkaloids. One of the best papers in this session is one in which Eleanor Zaimis elaborates the interesting theory that "tolerance" to ganglionic blockers is due, not to decreased sensitivity of autonomic ganglia, but to sensitization of peripheral effector cells to epinephrine and norepinephrine.

In the third session the clinical application of hypotensive drugs is thoroughly discussed. As a result of five- and six-year follow-ups, McMichael, Smirk, and Hood (workers from England, New Zealand and Sweden, respectively), appear to be convinced of the value of these drugs, particularly in the case of hexamethonium and pentolinium. On the other hand, the clinical experiences of the American worker, Perera, cause him to state that although the hypotensive drugs may relieve symptoms and manifestations, there is no reason to believe that drug therapy is specific or will solve the basic problems of primary hypertension. After the general discussion the consensus appeared to be that drug therapy is of real benefit in the accelerated or the malignant phase of hypertension, but that it should be employed with caution in early hypertension, while promiscuous drug therapy in patients in whom the only finding is raised blood pressure can only be deplored.

The last session of this symposium is concerned mainly with physiology and pathogenesis of hypertension. The various known causes of acute hypertension, hormonic, neurogenic, and renal, are discussed in detail in a number of papers, and the results of experimental studies in man and in animals are reported. The chairman at this session, Professor Clifford Wilson, succinctly summarizes the situation when he states that however dissimilar the modes of origin, hypertension in its fully developed and chronic state can be considered as a single disorder with no distinguishable differences in clinical picture, morbid anatomy, or physiological disturbance of the cardiovascular system.

The volume is complete with a subject and author index and references. The references in some cases do not appear to be very exhaustive and are limited mainly to British and European journals. This book should find a place in the library of any pharmacy school, although it will undoubtedly prove to be of more value to graduate students and research workers than to the average undergraduate.

Arthur Tye
The Ohio State University

Ion Exchange and Its Applications. The Macmillan Company, New York 11, New York, 1956. 173 pp. 8¼ x 11, 29 tbls., 8 plates, 70 figs. $7.50.

Ion Exchange and Its Applications is an import of the proceedings of a conference held under the sponsorship of the Society of the Chemical Industry in London, 1954.

Although the volume has no foreword, preface, or introduction in the usual sense, the first paper of the conference, by C. W. Davies, sets the tone for the contributions which follow.

The papers are grouped according to the six sessions in which they were presented.

The first session or section deals with a graduated presentation of the theory of ionic exchange. Session two has a group of articles devoted largely to the engineering aspects of ion exchange. Sessions three and four emphasize the application of the use of ionic exchangers with inorganic compounds, simple and complex, along with the analytical methods of evaluating the properties and capabilities of ion exchange resins.

Sessions five and six include papers of practical importance related to chromotographic separation of natural products. It is this section, I am afraid, which will command the most attention from organic, biological, and pharmaceutical chemists.

Section one or session one will also be read and re-read by those who need basic understanding of the theory of ion exchange chromatography, but those who need to know the details of actual operation will have to look elsewhere for assistance. Such assistance is given in references in each paper.

The volume is strong on theory, and the discussion at the end of each paper, except the first, is thought provoking, but the book will be of interest to a limited number of pharmacists and chemists.

It is this reviewer's opinion that the publication is authoritative and fills a great need as a supplement to those sketchy introductions dealing with the utility of ion exchangers that one finds stuck in texts dealing with quantitative

analysis, organic chemistry, and biochemistry; however, the value of this book is seriously impaired by the lack of an index. The people who are likely to want to use such a volume as this are far too busy to have to thumb through the whole thing to find what they want. I, therefore, recommend this conference report as a necessary addition to the institutional pharmacy library but not for the personal library.

L. L. Woods
Texas Southern University

Organic Chemistry Volume Two, Stereochemistry and the Chemistry of Natural Products, I. L. Finar, Longmans, Green and Co., New York, New York, 1956. xi + 733 pp., 42 figs., 10 tbls. $8.50.

This is a continuation of the author's *Organic Chemistry Volume One,* Second Edition, 1954. In the earlier book he stated, "Since I do not consider the chemistry of natural products fundamental chemistry but rather the applications of fundamental principles, I have excluded almost completely the study of natural products." This book supplies the "applications of fundamental principles." The author states, "The subject matter covered should serve as a good introduction to the organic chemistry required for students reading for Part II of the Special Honours degree in chemistry of the London University."

The division is into twenty-nine chapters with the first six devoted to physical properties and chemical constitution and isomerism. The remaining chapters discuss natural products under the usual headings such as carbohydrates, glycosides, alkaloids, steroids, etc.

Chapter I contains an excellent condensed review of theoretical physical organic chemistry. While not sufficient for the professional chemist, this chapter is perhaps ideal for premedical, pharmacy, and agricultural students, etc.

In the chapters on natural products the emphasis is on reaction mechanisms and on the analytical and synthetic evidence for the structures of the various compounds described.

It would have been well to mention in the chapter on carbohydrates the chief cellulose derivatives such as CMC, methylcellulose, ethylcellulose, and oxidized cellulose, and give the reactions by which they are made. The chapter on chemotherapy is rather short. While it contains a brief discussion of the non-naturally occurring sulfonamides, no mention is made of the tetracycline group. In the discussion on Cyanocobalamin there is no mention of the method of production, merely the statement that it "has been isolated from liver."

The text, as a whole, is well written, being presented in a clear, concise style. It will be of great value as a reference to the beginning graduate student in the field in the American university, and to some extent to the undergraduate student. It will have a limited consideration for adoption as a text in this country, but it is an excellent reference for the pharmacy library.

L. G. Gramling
University of Florida

Recent Advances in Pharmacology, J. M. Robson and C. A. Keele. Second Edition. Little, Brown and Company, Boston, Massachusetts, 1956. xii + 501 pp., 66 illustrations. $10.00.

This book was not designed as a complete textbook of pharmacology. Rather, it is devoted to recent pharmacologic advances relative to fourteen selected topics, each presented as a separate chapter. Each chapter is followed by a comprehensive bibliography including numerous references to recent reviews.

Topics covered are epinephrine and norepinephrine; neuromuscular blocking drugs; hypotensive drugs; histamine and serotonin; chlorpromazine and antiemetics; the adreno-hypophyseal system; the newer antibiotics; the chemotherapy of tuberculosis; salicylates and phenylbutazone; nucleotoxic drugs; radiation hazards; hemopoietic substances; anticoagulant drugs; and the control of body functions by chemical substances.

Little space is devoted to therapeutics; in fact, the volume might well be considered a treatise on pharmacodynamics. This does not detract from the value of the book to one whose interest lies in pharmacological research or to the more advanced student of pharmacology. The metabolism of each drug is well covered as is the *in vivo* formation of drugs such as epinephrine, histamine, serotonin, the adrenal corticoids, etc. Considerable attention is paid to mechanisms by which the various drugs exert their effects. The chapters relative to the nucleotoxic drugs, radiation hazards, and the adreno-hypophyseal system, in the opinion of this reviewer, are especially well documented and offer an excellent coverage of these topics in light of recently acquired knowledge. Throughout the entire book, however, the subject matter is clearly and concisely presented.

This reviewer was quite favorably impressed with the book. It is not as comprehensive as several of the well-known textbooks of pharmacology, but it does serve as an excellent source of information relative to the topics which it includes. It should be a valuable addition to the library of a college of pharmacy as well as to the personal library of the research worker or student of advanced pharmacology.

Harold C. Heim
University of Colorado

Advanced Organic Chemistry, E. Earl Royals. Prentice-Hall Inc., New York, New York, 1956. xii + 948 pp. $12.00.

The contents of this book appear not to have been altered appreciably in its second printing. It is intended as a text for a second course in organic chemistry, and as an aid to graduate students in preparing for comprehensive examinations in organic chemistry.

The emphasis is on presenting the fundamental behavior patterns involved in organic reactions in terms of electronic theory. The first chapter of seventy-nine pages, entitled "The Structure and Reactivity of Organic Compounds," includes a brief and fairly good discussion of the nature of the chemical bond, resonance, the hydrogen bond, chemical kinetics and equilibrium, principles of electronic theory, hyperconjugation and steric effects. The interpretation here and in the rest of the book is in terms of resonance among different valence bond structures and the notation is by means of the curved arrows or "fish hooks" and $\delta+$, $\delta-$ signs.

The text is not intended as a one-volume reference book, and the subjects covered are limited as indicated by the chapter headings which include alkanes, cycloalkanes, alkenes, alkynes, aromatic hydrocarbons, and the carbonyl compounds. The actual content is not as limited as this might imply, for, although a chapter or section on alcohols for instance is not present, there are sixty-eight references under alcohols in the index where they come up for discussion in connection with other types of compounds.

The size of the type is a bit small for easy reading, particularly so since the pages are not divided into two columns and the lines extend across the page. The binding does not seem very durable in view of the fact that some of the pages of the copy sent to me for review are already coming unsewn and unglued.

The book is well indexed, with an extensive eighty-nine page subject index as well as an author index. There are numerous references to the literature, and these are placed as footnotes at the bottom of each page. The references are numbered consecutively through each chapter, and usually from one to eight are at the foot of a page. The references do not appear to have gone beyond 1953, and the cut-off for most of them is 1951.

Most of the structural formulas in the book do not have names under them. If a student does not know what a compound is from its structure, he may be able to find reference to it in the text, or he may not.

The book does not discuss molecular orbitals as applied to organic chemistry, and this is its most serious deficiency, for some knowledge of this subject is becoming a must for the advanced student of organic chemistry.

There are places where the expression is a bit awkward; for example, on page 28 where it is stated a structure ". . . contributes more largely to the resonance state." On page 35, in the discussion of the structure of the nitro group, the student might get a false impression from the statement "the nitro group possesses a definite dipole moment because of the presence of the semipolar bond with an actual separation of charge; the positive end of this dipole is concentrated on the nitrogen atom; the negative end, however, is concentrated on neither oxygen atom, but on a line bisecting the O-N-O angle." The actual situation is that a full position charge is concentrated on the nitrogen and one half of a negative charge on each oxygen atom, giving rise to two dipoles in the direction of each N-O bond. These add vectorially to give a resultant dipole which would be on a line bisecting the O-N-O angle. It is dubious if the student would arrive at such an impression, however, from the statement in the book.

In general the book presents the essential basic principles and contains a large amount of information on the transformations undergone by the types of compounds it covers, together with theoretical correlations and interpretations of that data. This, coupled with a good subject index and extensive references to the literature, makes the book of use not only to students taking an advanced course in organic chemistry and graduate students preparing for comprehensive examinations, but also to practicing organic chemists.

W. D. Kumler
University of California

Organic Analysis Volume III, John Mitchell Jr., I. M. Kolthoff, E. S. Proskauer, A. Weissberger, Editorial Board. Interscience Publishers Inc., New York, New York, 1956. 546 pp., 57 figs., 109 tbls. $11.50.

Organic Analysis Volume III is the third volume in a series of books devoted to the analysis of organic compounds. There are six sections in the book which include the following topics: determination of organic acids, determination of acid anhydrides, determination of amines and amides, determination of olefinic unsaturation, analytical mass spectrometry, and synthetic organic coating resins. Each section is presented by a different author, the authors being men from industry.

The objective of the book is to present methods for the analysis of organic compounds, particularly functional groups. General methods are intended; however, in some cases specific determinations of important compounds are given. Each section is prefaced by a list of methods. The lists are impressive particularly from the

standpoint of diversity of approaches and from the number of modern techniques included. The selection of methods is excellent; for example in the determination of organic acids the following are presented: neutralization, oxidation-reduction, displacement, aquametry, gravimetry, polarography, coulometry, colorimetry, infra red absorption, mass spectrometry, x-ray diffractometry, chromatography, extraction, and distillation. In addition to the above, various end point detections are discussed: visual, potentiometric, conductimetric, high frequency, photometric and thermometric. Other sections require a different approach, with the methods being primarily chemical, but the selection of methods is broad and up to date.

A discussion of each method in detail within one volume would be impossible; however, some topics have been discussed in detail in previous volumes as mass spectrophotometry is covered in this book. The organization of the book is based on a brief discussion of the method, well referenced to original sources, followed by a detailed method of procedure.

The entire volume is well written, readily comprehended, and presents an excellent addition to the other volumes of the series. The series itself is highly recommended as a reference for college of pharmacy libraries.

Edward Krupski
University of Washington

Physical Chemistry for Students of Pharmacy and Biology, S. C. Wallwork. Longmans, Green and Co., Ltd., London, England, 1956. xi + 307 pp., 44 figs. $4.75.

The increasing trend in pharmaceutical education toward giving students more thorough training in the fundamental principles in their field is exemplified by this textbook for a short course in physical chemistry designed specifically for pharmacy students. Although this is the first book of its kind written especially for pharmacy students, it is similar in scope and treatment to the three or four physical chemistry textbooks for pre-medical students currently on the market, and shares many of their virtues and weaknesses.

The book assumes previous training in organic chemistry. Some knowledge of analytical chemistry, while not essential, would be found helpful. Compared with other physical chemistry texts, the mathematical demands on the reader are small. The first chapter of the book is entitled "Mathematical Preparation," and is intended to furnish the reader a review and some extension of his training in mathematics. Since the author starts with a discussion of graphs and works his way through integration of polynomials in twelve pages, it can be seen that the treatment is highly condensed. Many teachers may prefer to present this material as it is needed, rather than all together at the beginning. Applications of any mathematics beyond college algebra are, however, infrequent, and are seldom vital to the main argument.

The author has attempted to select the portions of physical chemistry that are particularly relevant in the study of biological systems. After the introductory mathematical chapter, he discusses the properties and constitution of matter, the structure of atoms, the structure of molecules, chemical reaction, properties of solutions, electrolytic dissociation, electrochemical cells, acids and bases, surface chemistry, and colloids. The author has achieved a nice balance in devoting the main portion of his time to basic principles, yet introducing enough examples of pharmaceutical application to maintain the interest of the student.

All discussion of thermodynamics has been omitted from this book. For the most part, this decision may be considered reasonable, but it would seem desirable to have a more extended discussion of the energy changes accompanying chemical reactions. The concept of free energy, which can easily be introduced in a work of this sort, has a wide applicability in explaining and correlating many diverse phenomena. More serious, perhaps, is the very small amount of attention which has been paid to the concept of equilibrium. Here, again, an idea which can be used to simplify the discussion of many of the topics covered has been largely ignored.

One novel feature of the book is a list of ten experiments suitable for the student to perform, using very simple equipment. It would be difficult to fit these experiments into any regularly scheduled laboratory period, however, since many of them are grouped toward the latter part of the book. If a course is being offered with laboratory, the teacher will probably prefer to use a separate laboratory manual or mimeographed instructions.

There are a number of problems at the end of each chapter, the answers being given in an appendix. The quality of the problems is good, but they are disappointingly few in number.

Although the over-all quality of this book is not up to the level of the better books used in the larger courses in chemistry where competition is more keen, it compares well with others of its kind and deserves the serious consideration of the teacher of a one-semester course. It should also prove useful to the independent student seeking some knowledge of the subject, and deserves a place in the pharmacy library.

James E. Boggs
The University of Texas

Organic Synthesis, Nelson J. Leonard, Editor-in-Chief. John Wiley and Sons, Inc., New York, New York, 1956, vi + 120 pp. $3.75.

This book, like its thirty-five predecessors, is a compilation of tested preparative organic chemical procedures. The high standards for excellence of the previous volumes appear to have been continued, as illustrated by the wide variety of procedures for the preparation of compounds which are of general interest or which illustrate useful synthetic methods.

Synthetic procedures for thirty-five compounds are given in full detail. All of the procedures are not of general applicability, but, if not, stress novelty or potential wide interest in the method or specific product. An illustration of this would be the preparation of ferrocene (dicyclopentadienyl iron), a recent compound of theoretical significance. As in previous volumes all methods are submitted and checked by competent investigators.

It appears to this reviewer that each annual volume of this monumental work becomes increasingly difficult to assemble, due to the paucity of investigators desirous of submitting or checking procedures. The editor, contributors, and publishers are to be congratulated for the continuation and quality of the work.

Edward E. Smissman
University of Wisconsin

Excitability of the Heart, Chandler McC. Brooks, Brian F. Hoffman, E. E. Suckling, and Oscar Orias. Grune and Stratton, New York, New York, 1955. xiv + 373 pp., 86 figs., 13 tbls. $6.50.

This book is a monograph on the extensive research done by the authors, who have contributed some of the major recent investigations in this field, utilizing the modern methods of electrophysiology. However, the report of the work is woven into a broad general consideration of the whole field of heart and tissue excitability, including comprehensive literature reference lists after each chapter. It thus becomes, as Dr. Carl J. Wiggers suggests in the foreword, a classic in this field. Chapters on excitation in general, methods of studying cardiac excitability, the cardiac cycle, transmembrane potentials of cardiac fibers, fibrillation and antifibrillatory agents, the relations of mechanical muscular responses to excitatory events in the heart, and effects of temperature, autonomic nerves, chemical mediators, certain cardiac drugs, and inorganic ions on cardiac excitability are included. A summary is provided at the end of each chapter, helping the less initiated reader to focus his thoughts on the subject.

The book is essential to all investigators and students of cardiac function and pharmacology. It should therefore be included in all pharmacy libraries, and will be useful as a reference work in courses dealing with drugs for the heart and autonomic nervous system.

Of course, even with such aids as the general historical and summary discussions of the backgrounds in excitatory and cardiac processes that are provided, and even though the book is written in a fairly readable style, the average pharmaceutical reader will find it hard going to master the book. This would not be a fault of the book, which was evidently written for investigators, medical practitioners, and students already possessing some working familiarity with these general subjects. It merely serves to emphasize the general need for a well-rounded education in physiology and in biophysics for students in pharmacy and pharmacology, particularly those who intend to pursue a research and teaching career. It may be agreed, with considerable justification, that the average pharmacy student who plans to limit himself largely to the preparation and dispensing of drugs does not have the interest, background, or, in general, the ability, to receive as thorough a training in these and certain other subjects as is necessary for the more research-minded student. One attempt at a solution to this general problem is of course to provide for graduate research curricula leading to higher academic degrees (M.S. or Ph.D.) in the special field of interest; but a student who starts out as a pharmacy student will generally find he has to spend an additional amount of time taking more thorough courses in the basic sciences than those he had already taken in his pharmacy program. This extra time can act as a deterrent to attracting able and interested students into research and teaching fields.

I wonder if the time has not already come when we should at least be considering the possibility of having two types of curricula in pharmacy. One curriculum would be designed for the student more able and interested in getting the broad, thorough scientific education that every first-class professional man in any medical science should have; another curriculum would be designed for the student interested only in a career on the more technical level of drug preparation and dispensation. This might improve the efficiency of both the teaching and learning processes.

Benjamin Libet
University of California

Rauwolfia: Botany, Pharmacognosy, Chemistry and Pharmacology, Robert E. Woodson Jr., Heber W. Youngken, Emil Schlittler, and Jurg A. Schneider. Little, Brown and Company, Boston, Massachusetts, 1957. xii + 149 pp., 25 figs. $5.50.

An extensive literature has sprung up in the field of *Rauvolfia* since the isolation of reserpine in 1952 by Schlittler and coworkers. The therapeutic and scientific importance of the alkaloids make a monographic presentation of this drug both timely and welcome. The book contains four chapters, each written by men who have been active themselves in the investigation of that specific area: botany by Woodson, pharmacognosy by Youngken, chemistry by Schlittler, and pharmacology by Schneider.

The monograph limits itself to taxonomy of the genus, morphology, and anatomy of the roots and structural and pharmocodynamic studies of the alkaloids. Problems dealing with cultivation, variation, commerce, analysis, and therapeutic and social aspects of the drug have not been included. The chapters on botany and pharmacognosy are based mainly upon the personal works of their authors, and only little of the literature of British, French, German, Indian, Swiss, and other foreign authors is discussed in these chapters. The chemical and pharmacological chapters include extensive literature references.

It is gratifying to find the taxonomy of the genus treated in detail, for the literature is often confusing on this point because of the use of different synonyms by the various authors to designate the species. It is regrettable that an incorrect ortography is adopted in the writing of the name of the genus. It is true that it is most often spelled with *w*, but this erroneous practice ought not to justify a deliberate disregard of the nomenclature rules which were internationally adopted with the purpose of creating uniformity in the scientific naming of plants. The Indian Symposium on *Rauvolfia* in 1955 clearly rejected the spelling with *w*, and an inconsistency becomes evident when *v* is being used in the writing of derived names such as Afrovolfia.

All chapters are expertly written and quite technical. The section on chemical structure of the alkaloids offers the reader a particularly interesting study. Although limited in scope, the monograph will serve as a very valuable reference for teachers and other workers in the field of *Rauvolfia*.

Egil Ramstad
Purdue University

Enzyme Antigen and Virus, Sir F. Macfarlane Burnet. Cambridge University Press, New York, New York, 1957. viii + 193 pp., 8 figs. $3.50.

This book is concerned with the pattern of protein synthesis that is involved in the production of enzymes, antibodies, and viruses. Factors that are common to the production of adaptive enzymes, the stimulation of antibody production by antigen, and the multiplication of viruses are reviewed and related to a possible general mechanism of protein synthesis.

Experimental evidence relating to the nature of adaptive enzyme synthesis in microorganisms is reviewed, and the role of the two types of nucleic acids in their synthesis is discussed.

The second type of functional protein, namely antibody production, is then considered. A summary of the essential characteristics of the antibody response is included, and evidence for the author's "self-marker" hypothesis of antibody production is reviewed. The "self-marker" concept is defined to explain the lack of antigenicity of the body's own components. This pattern is believed to be set by a non-genetic mechanism during embryonic development.

The "self-marker" hypothesis in relation to cell proliferation and control is also discussed.

One chapter is devoted to a consideration of virus multiplication. After a brief introduction to bacterial and plant viruses, there follows a detailed analysis of influenza virus multiplication.

It has been the aim of the author to evaluate data with a view to finding some general description of protein synthesis applicable to enzyme, antibody, and viral production and, by implication, to all protein synthesis.

The material is presented in an interesting manner and will be of especial interest to all investigators concerned with the general aspects of protein synthesis.

There are approximately 200 references. Although an index is not included, the table of contents is adequate.

Frank L. Mercer
St. Louis College of Pharmacy and Allied Sciences

Blakiston's New Gould Medical Dictionary, Norman L. Hoerr and Arthur Osol, Editors, with the cooperation of an editorial board and eighty-eight contributors. Second Edition. McGraw-Hill Book Company Inc., New York, New York, 1956. xxvi + 1463 pp., 45 figs., 33 tbls. $11.50.

This is the second edition of a very fine medical dictionary. Twelve thousand new terms have been added, and 8000 changes have been made, modernizing spelling and usage throughout. A new table of isotopes used in medicine has been included, and other tables have been expanded with recent information.

The arrangement of the new edition is similar to that of the first. Grouped together in the center of the book are forty-five colored and halftone plates that include reproductions, diagrams, and illus-

trations of the anatomy, pathology, injuries, and development of the human body. The appendix contains a variety of useful tables of information relating to anatomy, biochemistry, pathology, physiology, and pharmacy. Of course the bulk of the book is devoted to the definition, description, and etymology of the thousands of terms and proper names used in medicine and its allied fields.

One of the unusual features of this dictionary is its coverage of many of the modern proprietary and official drugs. The treatise also excels in its treatment of many of the latest terms used in the experimental areas of medical research. Throughout the entire text it is easy to detect the influence of the pharmaceutical background of one of the editors.

Over-all the Gould dictionary compares very favorably with other dictionaries of this class and can be highly recommended to all members of the health sciences. A reference dictionary of this quality should be a part of the reference shelf of every pharmacist and pharmacy student.

Donald B. Meyers
Butler University

If pharmaceutical education is to offer the student the maximum opportunity for self development and a satisfying personal life, it must provide an experience as broad and rich as possible in those areas of learning which are a universal part of the culture.

Glenn L. Jenkens, Am. J. Pharm. Ed., 9, 413 (1945)

NEW BOOKS

Clinical Physiology: The Functional Pathology of Disease, Arthur Grollman, Editor. Blakiston Division, McGraw-Hill, New York, 1957. 854 pp., illus. $12.00.

Textbook of Pharmacognosy, T. E. Wallis, Third Edition. Distributed by Little, Brown and Company, Boston, 1955. 578 pp., 237 figs. $8.00.

The Biologic Effects of Tobacco, Ernest L. Wynder, Editor. Little, Brown and Company, Boston, 1955. 215 pp., 20 figs. $4.50.

The Bubonic Plague and England, Charles F. Mullett. University of Kentucky Press, Lexington, 1956. 401 pp. $9.00.

Current Concepts in Digitalis Therapy, Bernard Lown and Samuel A. Levine. Second Printing. Little, Brown and Company, Boston, 1954. 164 pp., 21 figs. 4½ x 7½. $4.00.

Guide to Medical Writing, Henry A. Davidson. The Ronald Press Company, New York, 1957. 338 pp., 11 figs. $5.00.

Dorland's Illustrated Medical Dictionary, Editorial Board. Twenty-third Edition. W. B. Saunders Company, Philadelphia, 1957. 1598 pp., 750 illus. $12.50.

Dairy Microbiology, Edwin M. Foster, F. Eugene Nelson, Marvin L. Speck, Raymond N. Doetsch, and Joseph C. Olson. Prentice-Hall, Inc., Englewood Cliffs, New Jersey, 1957. 492 pp., illus. $4.25.

Drugs in Current Use, 1957, Walter Modell, Editor. Springer Publishing Company, Inc., New York, 1957. (paper) 152 pp. $2.00.

Paper Electrophoresis, W. E. W. Wolstenholme and Elaine C. P. Millar, Editors. Ciba Foundation Symposium. Little, Brown and Company, Boston, 1956. 224 pp., 74 illus. $6.75.

The Stress of Life, Hans Selye. McGraw-Hill Book Company, New York, 1956. 324 pp., illus. $5.95.

Determination of Organic Compounds, H. G. Stone. McGraw-Hill Book Company, New York, 1956. 233 pp., illus. $5.00.

Venoms, Eleanor E. Buckley and Nandor Porges, Editors. American Association for the Advancement of Science, Washington, D.C., 1956. 480 pp., 113 illus. $8.25.

Vitamins and Hormones, Volume XIV, Robert S. Harris, G. F. Marrian, and K. V. Thimann, Editors. Academic Press, Inc., New York, 1956. 486 pp., illus. $10.00.

Recent Progress in Hormone Research, Volume XII, Gregory Pincus, Editor. Academic Press, Inc., New York, 1956. 453 pp., illus. $10.00.

Semimicro Qualitative Organic Analysis, Nicholas D. Cheronis and John B. Entrikin. Second Edition. Interscience Publishers, New York, 1957. 774 pp., illus. $9.00.

A Practical Manual of Medical and Biological Staining Techniques, Edward Gurr. Second Edition. Interscience Publishers, Inc., New York, 1956. 451 pp. $6.50.

Amino Acid Handbook, Richard J. Block and Kathryn W. Weiss. Charles C. Thomas, Publisher, Springfield, Illinois, 1956. 386 pp., 44 figs., 35 tbls. $10.50.

The Merck Manual, Editorial Board. Ninth Edition. Merck & Company, Inc., Rahway, New Jersey, 1956. 1870 pp. 4½ x 6¾. $7.50.

Fundamentals of Immunology, William C. Boyd. Third Edition. Interscience Publishers, New York, 1956. 790 pp., 72 illus., 95 tbls. $10.00.

Heterocyclic Compounds, Volume 6, Robert C. Elderfield, Editor. John Wiley & Sons, Inc., New York, 1957. 753 pp. $25.00.

Pharmacy Museums, George B. Griffenhagen. American Institute of the History of Pharmacy, Madison, Wisconsin, 1957. 51 pp. $1.00.

Encyclopedia of Chemical Technology, Raymond E. Kirk and Donald F. Othmer, Editors. Interscience Encyclopedia, Inc., New York, 1957. Fifteen volumes of approximately 960 pp. each. $375.00 (after July 1, 1957, $400.00).

Challenges to Contemporary Medicine, Alan Gregg. Columbia University Press, New York, 1956. 120 pp. $3.00.

An Inventory of Social and Economic Research Health, Frederick R. Strunk. Fifth Edition. Health Information Foundation, New York, 1956. 254 pp. (paper) Free.

Complete Manual of Therapy with the Meti-steroids, Schering Corporation. Schering Corporation, Bloomfield, New Jersey, 1956. 152 pp. Free.

MISCELLANEOUS PUBLICATIONS

Information for Physicians on the Salk Poliomyelitis Vaccine Number 4, Thomas M. Rivers, Editor. National Foundation for Infantile Paralysis, New York, 1957, 33 pp., 4 figs., 5 tbls. (paper) Free.

Corn Syrups and Sugars, Technical Service Committee of Corn Industries Research Foundation, Inc. Corn Industries Research Foundation, Inc., 1001 Connecticut Ave., N. W. Washington 6, D.C., 1956. 47 pp., figs., 13 tbls. (paper) Free.

Pharmacy-Study Portfolio, AACP Committee on Recruitment Aids. American Association of Colleges of Pharmacy, 833 South Wood Street, Chicago, Illinois, 1957. This portfolio contains two short talks entitled, "A Career in Pharmacy" and "Time for Tomorrow"; a summary of some of the current statistical data on the profession; a description of two recruiting films; and four pamphlets entitled, *Shall I Study Pharmacy, I'll Take Pharmacy, Should You be a Pharmacist,* and *The Bridge Between.* $.50 per portfolio or $40.00 per 100 portfolios.

NEW FILMS

Unconditional Surrender. 16 mm. sound 14-minute and 24-minute versions showing actual manufacture and testing of the Salk vaccine. Available on loan free from the Division of Public Education, The National Foundation for Infantile Paralysis, 120 Broadway, New York 5, New York.

Nerve Gas Casualties and Their Treatment. 16 mm. sound color film, 30 minutes. Available on loan free from Film Library, E. R. Squibb and Sons, 745 Fifth Avenue, New York 22, New York.

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R. A. Kuever, Am. J. Pharm. Ed., 5, 441 (1941)

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